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The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

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[OFFICIAL NOTICE.]

August Meeting, Society of Gas Lighting.

OFFICE OF THE SECRETARY, Aug. 5, 1898.

The August meeting of the Society of Gas Lighting will be held at "Squantum," R. I., Wednesday next.

FRED. S. BENSON, Secretary.

BRIEFLY TOLD.

IN THE MATTER OF "EXTENSION OF MEMBERSHIP," WESTERN GAS ASSOCIATION.—In his inaugural address, at the meeting of the Western Gas Association last May, President Lynn, discussing the topic of "New Members," suggested that it might be a good plan to have committees appointed from the several Western States, the appointees to be charged with the task of seeing to it that those gas companies heretofore unrepresented by membership in the Western Association should acquire such membership. The committeemen were to use that discretion in argument over their cause which, while it did not offend, would be convincing. That task, of course, is an easy one; for no gas company in America can afford to be unrepresented by membership in one or more of the Gas Associations, simply from the standpoint of a dollar-and-cent view to themselves. What is meant here is that every dollar spent by a gas company in having membership in one or more of the Gas Associations will be returned manifold through the benefits that such membership means. President-elect Thompson, who succeeds Mr. Lynn in the Western Association's presidential chair, evidently is a thorough believer in his predecessor's suggestion; acting thereon, Mr. Thompson has, after due and appropriate conference with his fellow-executives, arranged a plan that is feasible in respect of adding many to the rolls of the Western Gas Association. The matter appended shows the action that has up to this time been taken in the premises:

WESTERN GAS ASSOCIATION,
OFFICE OF THE PRESIDENT, NEW YORK, July 29, 1898.

Dear Sir: The value of our Association depends upon the representative character of its membership and upon the personal interest which each of its members may take in its welfare.

The first condition can only be reached in its full sense when every gas man in our territory is with us, benefitting by what we are doing, and helping us to do it better. The second condition involves more than mere payment of dues and passive attendance at conventions; it means work. We may give our goodwill to a project, but our interest is lacking until we begin to work for it.

That the work of an Association is not confined to the few days of its annual gathering, but involves much thought and effort in preparation, is realized by us all. In order to take a further step toward the accomplishment of both the above conditions, a Committee on Extension of Membership is now appointed, constituted as shown by the accompanying list. It is earnestly hoped that you will accept the appointment here tendered you, and co-operate with your fellow members in endeavoring to enlist the interest of all gas men in your section who are not already members of the Western Gas Association. The eminently practical nature of our proceedings, the interchange of thought and experience between the formal sessions, and the many other advantages of membership and attendance, are too well known to need repetition here; and it is not too much to say that no gas man can afford to miss a meeting, nor can his company afford to have him miss one.

If you will kindly write to Mr. E. G. Pratt (Chairman of the National Committee, Des Moines, Iowa), stating your acceptance of this appointment, a supply of blank applications for membership will be sent you.

No "recruiting literature" has been prepared, as it is considered that personal appeal to your friends will be more effective than cold print. All questions and reports of progress, as well as the filled-out applications, should also be sent to Mr. Pratt. With best wishes I am,

Yours fraternally, GEO. TREADWAY THOMPSON, Pres.

The Committee on Extension of Membership, as named by President Thompson, which completes the record so far made in this instance, is:

NATIONAL COMMITTEE.

E.G. Pratt, Chairman, Des Moines, Ia. I. C. Copley, Aurora, Ills.
Jas. W. Dunbar, New Albany, Ind. Wm. McDonald, Albany, N. Y.

STATE COMMITTEES.

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For Tennessee.—James Forbes, Chattanooga; Robert Young, Jr., Knoxville; J. H. Cardall, Memphis.

For Indiana.—C. M. Keller, Columbus; William Wallace, Lafayette; E. F. Lloyd, Fort Wayne.

For Michigan.—C. H. Raynor, Adrian; John R. Lynn, Benton Harbor; W. H. Morgans, Pontiac.

For Iowa.—S. M. Highlands, Clinton; George F. Goodno, Cedar Rapids; George McLean, Dubuque.

For Kentucky.—Donald McDonald, Louisville; W. B. Sellers, Covington; J. S. Brown, Danville.

For the East.—George H. Harper, Altoona, Pa.; D. J. Collins, Philadelphia, Pa.; John Gribbel, New York City.

For the Northwest.—B. F. Ellison, St. Paul, Minn.; H. C. Bolcom, Winona, Minn.

For the Central West.—William Tracy, Salina, Kas.; R. E. Cowdery, Topeka, Kas.

For the Southwest.—Thomas D. Miller, Dallas, Tex.; John Gimper, Galveston, Tex.

For the South.—James Ferrier, Columbus, Ga.; J. Tyler Russell, Jr., Selma, Ala.

At Large.—F. H. Shelton, Philadelphia, Pa.; E. H. Henderson, Pittsburg, Pa.; C. H. Jacobs, Detroit, Mich.; John Dell, St. Louis, Mo.; D. R. Russell, St. Louis, Mo.; A. B. Eaton, Chicago, Ills.

TABULATION OF PAPERS READ BEFORE THE AMERICAN AND WESTERN ASSOCIATIONS.—We call the attention of our readers to the tabulation of papers read before the American Gas Light Association and the Western Gas Association, which will be found on pages 191-92-93-94 of the current issue. The compilation was made for us by Mr. F. H. Shelton, whose accuracy in statistical work is admitted. This presentation, covering, as it does, the ground practically, completely and from the beginning, should prove of much convenience to every student of gas topics, for the reason that at a glance one can see the approximate amount and nature of what may or may not be found upon any subject in mind, from consulting the files of the Associations in question. Furthermore, the list of the papers read (with the names of their authors) as publicly uttered before the named Associations, is likely to afford chance for comment upon some of their matters, which comment may be at once interesting and instructive. Comments of such nature will appear in later issues of the JOURNAL.

NOTES.—The sums paid into the City Treasury of Cleveland, Ohio, by the local Gas Companies for the last half year (under the operation of the gas ordinance there governing) were as follows: By the Cleveland Gas Light and Coke Company, $26,033.86; by the Peoples Gas Light Company, $5,634.51. These sums represent 6½ per cent. of the gross earnings of the named companies for the half year ended June 24. ——Mr. J. B. Bancroft has been elected President of the Milford (Mass.) Gas Light Company, vice Mr. Chas. F. Claflin, who declined a re-election.——The new rates for a gas or electric light supply in San Bernardino, Cal.—the gas and electric interests of that place were recently consolidated—as declared by Manager A. W. Burt, are: Gas for fuel account, $3 per 1,000; for illuminating account, $4 per 1,000. A meter rental of $1 per month will apply in all cases where the monthly use of gas shows a value of less than $1. The electric rates are: Incandescent lights (16-candle power each); all night, $1 each per month; to midnight, 75 cents; not later than 9 P. M. (except Saturday), 50 cents. Arc lights: All night, $9 each per month; to midnight, $7 each; to 9 P. M., $6 each.

Address of the President (Mr. Frederick H. Eichbaum, of San Francisco, Cal.), on the Occasion of the Sixth Annual Meeting, Pacific Coast Gas Association.

Gentlemen:—As the custom that the President shall deliver an address is the penalty for the honor conferred upon him in elevating him to office, I shall endeavor to interest you for a short space of time, asking your indulgence for any shortcomings that may be manifest, in consideration that my predecessors have exploited all the fields of interesting subjects so diligently that it is (not to say impossible), difficult to bring before you matters of importance that are novel and of interest to those engaged in the business of furnishing light, heat and power to the communities in which they are located, and also to our friends allied to us in kindred pursuits.

It is a matter of pleasure to be able to state that the proceedings of the Pacific Gas Association have been commented upon with approbation by other Associations; notably by one of the two prominent Associations of British Gas Engineers. I hope that we may be able to continue as we have begun, and that the annual crop of interesting papers may be forthcoming in the future, as in the past. It will be conceded by all engaged in the gas business on this Coast that our great and crying need is an increase of population; which, of course, would mean an increased number of customers for light, heat and power.

This Coast, California more especially, has not received the increase of population that had been predicted, in view of the healthy climate, richness in production of the precious metals, and more recently the abundance of agricultural products that are shipped to all parts of the habitable world. The reason has been attributed to the immense Spanish grants which here existed before the acquisition of the territory by the United States. These, no doubt, by making the acquisition of land more difficult than in States, where land could be taken up under the regulations of the United State's Land Office, have had the effect of deterring immigration to a very great extent; especially as these grants, as a rule, embraced most of all that was valuable, either by location or richness of the soil. No doubt, also, the distance of the whole Coast from the centers of population and points where emigration first touches the shores of the United States, has helped to keep down the population of this Coast to its present small figure. When I say small, I mean comparative to our hopes and expectations.

Now, since our last meeting, two events of the most unexpected and opposite nature have come to pass, which must and cannot but help to bring about an increase of population on this Coast; namely, the immense discoveries of gold in Alaska, and recently, the war with Spain. And it is on account of the changes which must follow these events that I consider both are of the greatest interest possible to the members of our Association. Other changes there are, some accomplished and others within a short time of fruition, which are calculated to make the North Pacific, not, as heretofore, principally a place where the hunting of the whale and seal was carried on, but in the near future to be almost if not quite as busy as the North Atlantic. These changes, which I shall only name to call them to your memory, are the marvelous development of the Japanese empire; where, within the memory of the youngest of our members, a nation of semi-nude, self-sufficient barbarians has been changed to a people possessing all the latest discoveries in war and civilization, and eager, not only to follow but to lead, in art, science and mechanics—no other such change, in point of time, has taken place in any nation within the history of mankind. The opening of the Chinese Empire by concessions to foreign nations is another of the causes which must affect and increase the commerce of the North Pacific; and, lastly, the completion of the great Trans-Siberian Railroad, which will open up new markets for the production of the States bordering on the Pacific Ocean. It is probable also that the great need, and I may also say absolute necessity, of a speedy means of communication between the East and the West coasts of our country will have the effect of the completion of the Nicaragua Canal, which up to this time has been prevented by the scheming and lobbying of the Trans-continental railways.

In illustration of the rapidity of the march of the principal events I have mentioned, I recall to you that, at the time of our last meeting, Alaska was known to us only as a cold, bleak country, where, on Cook's Inlet and on Forty mile Creek, scant pay had been found by washing the auriferous gravels of those creeks and tributaries. Since that time it has been discovered that, on the Klondyke river and creeks running into it, beneath the frozen muck, at a depth of not usually over 25 feet, the richest deposits of gold that have ever been discovered in the annals of gold mining, taking into account the large extent of territory in which these deposits are found, have been definitely located

and proven to exist. These deposits lie in Canadian territory, but similar ones have been found in that part of Alaska owned by the United States, and the gold is there found to be of a higher grade than in the Klondyke region. An enormous emigration to Alaska has set in, and has continued without cessation all through the past winter and up to the present time. The output, which is pretty well ascertained, shows that, although the conditions in Alaska are hard and not to be withstood except by men of the most robust type, rich rewards can be obtained at the expense of hard work and endurance of hardships, which, although well understood, seem to be no bar nor hindrance to the rush of gold seekers from all parts of the world. As Alaska is not a desirable location for the families of these enterprising miners and the thousands who follow in the wake of successful mining, it is fair to assume that California and the whole Pacific Coast will receive an accession of population from this source.

The war with Spain, which will in all human probability result in an occupation of the Philippine Islands for quite a period (perhaps permanent), will no doubt have a similar effect by the stimulus given to trade with the richest portion of the globe, and with which, up to the present time, we have had but small commercial intercourse. In my judgment it is reasonable to assume that the conditions now existing, which did not exist and could not have been anticipated at the time of our last meeting, will have the effect of increasing the population, not only of California but of the Pacific Coast States, which increase is the great desideratum at this time. Having dwelt on this subject at greater length than I first intended, I shall pass briefly to a survey of the conditions affecting the lighting industry.

Municipal ownership now, as for some years past, is the bugbear which checks enterprise, by introducing an element of uncertainty as to the future, which, in view of the fact that, with only one exception of any note, municipal ownership has been unsuccessful and has been abandoned in cities where it would seem to promise success if anywhere, still there seems to be a desire to give the matter a California experience. There seems to be nothing to note in reference to the Welsbach system of utilizing gas for lighting. Some very powerful lights of this class have been devised which may supplant the electric arc lights under proper conditions; but such lights are too powerful for domestic use, and need no extended notice at this time.

The utilization of water power in this State, for driving machinery and lighting cities, continues to draw enterprise and capital, and it is probable that not many years will elapse before San Francisco will be supplied with electric current produced at a greater distance from the place of utilization than is now known of.

As to acetylene, the hopes at one time entertained of its being supplied at such a price as would allow it to be used in municipal lighting have been dashed by the recent publication of the price put upon carbide in Great Britain—fully $100 per ton; and in Germany but little less. At such prices acetylene can only come into competition with air gas, or air saturated with gasoline; and, if the cost is not too high, it will be used in hotels and country houses, etc., with great success. As its use is out of the question for municipal plants, it is not worth while to dwell upon its lack of availability to raise the candle power of other gases.

Having traveled somewhat out of the beaten path in the greater part of my address, I conclude, wishing that I had time to mention subjects of interest to us all as citizens of this great Republic, which has shown, within the last 90 days, that the spirit of '76 still is with us, and that the heroism which characterized our navy and army during the days of the revolution has not suffered by the cruel contest which terminated 33 years ago, seeing that North, South, East and West have rallied to the flag of the Union in a war which was forced upon this Nation in the cause of suffering and oppressed humanity.

[Compiled for the JOURNAL by MR. F. H. SHELTON.]

A List of all of the Papers Read before the American and the Western Gas Associations.

CLASSIFIED BY TOPICS AND ARRANGED CHRONOLOGICALLY.[1]

MANUFACTURE.

Coal Gas: General.

Coal Gas: A New Process, by J. E. Condict; A., 1870.
Some Practices in Gas Engineering and Manufacture Considered, by E. S. Cathels; A., 1876.
Dispensing with Dip Pipe in Hydraulic Main, by T. Forstall; A., 1877.
Supplying Gas Without a Holder, by C. H. Nettleton; A., 1879.
Stoppage of Ascension Pipes, by T. Forstall; A., 1880.
A Positive Cure for Choked Standpipes, by S. G. Stiness; A., 1884.
Stoppages in Small Works, by V. L. Elbert; W., 1885.
The Utilization of Waste Heat from the Benches, by J. W. Dunbar; W., 1885.
The Hydraulic Main, by F. W. Floyd; A., 1886.
Furnishing Gas Without a Holder, by J. W. Dunbar; W., 1887.
Retort House Work, by Geo. T. Thompson; W., 1889.
A Small Experimental Plant as an Aid to the Management of a Coal Gas Works, by P. Young; A., 1894.
Retort House Design and Practice, by A. E. Forstall; A., 1895.
Experience with Foul Gas, by J. R. Lynn; W., 1895.
A Modern Retort House, by W. A. Miller; A., 1896.
Enrichment of Coal Gas, by G. H. Harper; W., 1898.
Ignition of Gas by Static Electricity, by B. Taylor; W., 1898.

Benches.

Carbonizing Coals, by B. Rankin; A., 1877.
Temperature of Retorts, by F. S. Benson; A., 1877.
Retort Setting for small Gas Works, by E. S. Cathels; A., 1879.
The Dieterich Furnace, by W. Farmer; A., 1879.
Gas Furnaces, by A. Weber; A., 1880.
Comparative Results Between the Ordinary and the Dieterich Furnace in Benches of Retorts, by A. B. Slater; A., 1881.
Coal Tar as Fuel for Benches, by F. C. Sherman; A., 1881.
Generator Furnaces, by M. S. Greenough; A., 1881.
Regenerator Furnaces, by A. Weber; A., 1882.
New Furnaces, by W. A. Stedman; A., 1883.
Bench Furnaces: Regenerative and Recuperative, by J. Gimper; W., 1883.
Improved Furnaces, by A. C. Wood; A., 1885.
Flue Construction of Benches, by I. N. Stanley; A., 1886.
Draught, by J. Gimper; W., 1886.
Three-Hour Charges, by A. B. Slater; A., 1886.
The Advantages of Regenerative Furnaces for Large and Small Gas Works, by F. Bredel; A., 1887.
Development of the Half-Depth Regenerative Furnace, and Some of the Results, by O. B. Weber; A., 1887.
Distillation of Coal, by J. Gimper; W., 1887.
Half-Depth Regenerative Furnaces, by F. Bierce; W., 1888.
Retort Furnaces for Burning Coal, by K. M. Mitchell; W., 1889.
On the Use of Crude Oil for Firing Bench Furnaces and Enriching Coal Gas, by J. H. Woodmansee; W., 1889.
On the Practical Efficiency of a Semi-Regenerative Furnace, by J. W. Dunbar; W., 1891.
The Advantage of Recuperative Furnaces in the Utilization of Heat, by F. Bredel; W., 1892.
The Construction and Operation of Half-Depth Regenerative Furnaces for Firing with Cheap Coal, by W. H. Odiorne; W., 1892.
Recuperative Furnaces as Applied to Bench Firing: Their Operation and Results, by J. A. Faux; W., 1895.
Bench Firing with Soft Coal, by E. G. Pratt; A., 1895.
Isolated Generators for Bench Firing, by Geo. T. Thompson; W., 1898.

Stoking Machinery.

Steam Stoking Inventions, by A. Hickenlooper; A., 1880.
Stoking Machines, by M. S. Greenough; A., 1885.
The Ross Steam Stoker and Improved Charger, by A. Q. Ross; A., 1888.

Coke.

Burning Breeze Under Steam Boilers, by C. H. Nettleton; A., 1876.
The Use and Value of Coke for Generating Steam, by J. L. Hallett; A., 1887.
Mechanical Handling of Coke, by F. Bredel; A., 1892.

Inclined Retorts.

Inclined Retorts, by H. Pratt; W., 1888.
Inclined Retorts, by R. D. Walsh; W., 1889.
Inclined Retorts, by F. Egner; A., 1890.
Does it Pay to Use Inclined Retorts in Small Gas Works, by J. Gimper; W., 1891.
Inclined Retorts Up to Date, by F. Egner; A., 1896.
A Study of Inclined Retorts in Europe, by F. Egner; A., 1897.

Coals.

Gas Coals of the United States, by H. C. Adams; A., 1890.
Gas Coals with Special Reference to Provincial Coals, by J. D. Perkins; A., 1888.

1. "A.," American Association; "W.," Western Association.

Coal Gas Condensing and Scrubbing.

Smith & Farmer's Condenser and Scrubber, by F. C. Sherman ; A., 1876.
Condensation, by J. R. Smedberg ; W., 1883.
Small Gas Works and the Pelouze & Audouin Condenser, by J. R. Smedberg ; W., 1884.
The Construction and Efficiency of the Washer Scrubber of the Cleveland G. L. & C. Co., by G. A. Hyde ; W., 1884.
Perfect and Imperfect Condensation, by S. H. Douglas ; W., 1886.
Condensation, by R. B. Tabor ; A., 1886.
A Paradoxical Box, by B. E. Chollar ; W., 1888.

Residuals : Tar and Ammonia.

Residual Products, by G. S. Page ; A., 1880.
Residual Products, by G. S. Page ; A., 1881.
Coal Tar Products and Ammoniacal Liquor, by G. S. Page ; A, 1880.
New Uses of Ammonia, by G. S. Page ; W., 1884.
The Manufacture of Sulphate of Ammonia, by J. Somerville ; W., 1884.
Tar and Ammonia, by G. S. Page ; W., 1886.
The Utilization of Residual Products, by C. H. Nettleton ; A., 1887.
On the Removal of Ammonia from Illuminating Gas and the Best Method of its Accomplishment, by K. M. Mitchell ; W., 1891.
An Experimental Illustration of a Simple and Accurate Method of Determining the Commercial Strength of Gas Liquors, by B. E. Chollar ; W., 1891.
Saving and Proper Concentration of Gas Liquor, by Geo. Osius ; A., 1892.
Residuals : Ideas Concerning them Suggested by the Outlook, by J. Ferrier ; W., 1893.
Ammoniacal Liquor, with a Special Reference to the Universal Saving of Same by Gas Companies, by G. Osius ; W., 1895.
Method of Estimating the Value of Gas Liquors, by O. O. Thwing ; W., 1898.

Water Gas : Process Papers.

Facts in Regard to Water Gas, by J. S. Chambers ; A., 1878.
The Lowe Water Gas Process, by W. H. Pearson ; A., 1879.
Lowe Process of Water Gas Manufacture, by W. H. Pearson ; A., 1880.
The Manufacture of Gas from Coal and from Material Other than Coal, by A. L. Allen ; A., 1882.
New Process of Making Water Gas, by T. B. Fogarty ; A., 1882.
New Process of Making Water Gas, by T. B. Fogarty ; A., 1883.
The Lowe Process, by G. B. Burns ; W., 1883.
Water Gas, by Walton Clark ; A., 1887.
Illuminating Water Gas : Past and Present, by F. H. Shelton ; A., 1889.
A Winter's Experience with a Springer Plant, by W. L. Brown ; W., 1889.
Observations on Sundry Methods of Making Water Gas from Bituminous Coals, by F. Egner ; A., 1894.

Water Gas : Operation.

The Practical Efficiency of an Illuminating Water Gas Setting, by A. G. Glasgow ; A., 1890.
Theoretical Effect of Preheating Blast, Steam and Oil in Water Gas Manufacture, by R. Norris ; A., 1891.
Water Gas Condensation, by J. M. Rusby ; A., 1892.
The Selection of Anthracites for Generator Purposes, by C. R. Collins ; A., 1892.

Water Gas Tar.

Manipulation of Tar from Carbureted Water Gas, by D. Douglass ; A., 1891.
The Separation of Water Gas Tar, by A. S. Miller ; A., 1896.
An Oil Tar Separator and Its Results, by J. R. Lynn ; W., 1897.

Oils.

Petroleum Products : Hydrocarbon Employed in Gas Manufacture, by C. M. Higgins ; W., 1893.
Petroleum : Its Products and their Relation to the Gas Industry, by C. H. Evans ; A., 1894.
The Storage and Handling of Oils in a Gas Works, by D. J. Collins ; W., 1895.
Notes on Storage of Oil at Gas Works, by F. Egner ; A., 1895.

Oil Gas.

Petroleum Gas, by H. H. Edgerton ; A., 1874.
On the Use of Petroleum and Its Products in the Manufacture of Illuminating Gas, by J. D. Patton ; A., 1876.
The Pintsch System, by R. M. Dixon ; A., 1890.
Some of the Advantages of Oil Gas Plants for Small Towns, by J. W. Stratton ; W., 1894.

Purification.

Purification, by E. F. Cruse ; A., 1873.
Purification, by G. A. Hyde ; A., 1874.
The Purification of Gas, by C. A. Gerdenier ; A., 1876.
Valves vs. Center Seals for Working Purifiers, by S. G. Stinnes ; A., 1884.
Coopers' Limed Coal Process, by R. P. Spice ; A., 1885.
Cooper Coal Liming Process, by G. S. Page ; W., 1885.
The Result of a Month's Working with Limed Coal, by J. Somerville ; W., 1885.
An Experiment with Limed Coal, by W. Clark ; A., 1886.
Purification Puzzles, by Thos. Turner ; A., 1887.
The Comparative Illuminating Power of Gas Purified with Lime vs. Oxide of Iron, by C. W. Blodget ; A., 1887.
Purification in Closed Vessels, by F. Egner ; W., 1888.
Purification of Gas from Kansas Coals, by B. E. Chollar ; A., 1889.
Purification of Gas, by A. E. Forstall ; A., 1890.
Relation of Temperature to Purification, by J. Somerville ; A., 1893.
Rate of Purification, by J. A. P. Crisfield ; A., 1893.
Influence of Temperature on Purification, by J. Ferrier ; W., 1894.
A Quadruplex Purifying Box : Why not? by F. H. Shelton ; A., 1897.
Chemical Notes on Purification, by H. A. Mather ; A., 1897.
Report on Burner Stoppages, by P. Doty ; A., 1897.

Oxide and Lime.

On the Proper Preparation of Lime for Use in the Purification of Coal Gas, by T. Forstall ; A., 1875.
Iron Sponge for Purifying, by H. F. Coggshall ; A., 1884.
Lime, by A. W. Wilkinson ; A., 1891.
The Revivification of Iron Oxide, by G. T. Thompson ; A., 1893.
Revivification of Oxide of Iron in Purifiers, by I. C. Baxter ; W., 1897.

Gasholders.

Difficulties Encountered in the Construction of a Gasholder Tank, by E. McMillin ; A., 1885.
A New Departure in Gasholder Houses, by W. H. White ; A., 1886.
Construction of Gasholders with Wrought Iron or Steel Tanks above Ground, by F. Mayer ; A., 1888.
Care and Operation of Gasholders, by C. L. Rowland ; A., 1889.
Patching Holders while in Use, by J. H. Findlay ; A., 1894.
Metal Gasholder Tanks, by A. S. Miller ; W., 1895.

Photometry.

Crookes' Radiometer, by W. W. Goodwin ; A., 1876.
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The Wear of Chains.

By Mr. R. Weatherburn, in London *Engineer*.

The few accidents that occur to life and limb by the breakage of chains would tend to the belief that the quality of material from which they were made was exceptionally good, with frequent and capable examinations, or that a very generous margin of strength was allowed. The fact is that a far greater number of breakages take place than is ever known, but, in the vast majority of cases, are fortunately attended with no more serious result than damage to material and the inconvenience of delay, hence the complacency in which the indiscriminate and too often reckless use of chains is viewed.

The general application by land and sea, in workshops, factories, warehouses, shops, etc., must necessarily include a considerable proportion which never receive the benefit of periodical inspection. Nor is it to be supposed that a merchant or warehouseman should possess the knowledge, or have the time and desire, even if competent, to inspect such matters. It is generally sufficient for him to have repaired with the utmost dispatch or renew one which has caused trouble and delay by breakage. Even in the larger industries, where the services of engineers are more frequently requisitioned, the chains only receive desultory attention. It is only too true that the accidents that do occur are mainly the result of the margin of safe wear being exceeded, and that the tardy attention given is due to such unpleasant notifications.

Nearly every class of machinery is open to Government inspection or control, but the chain of the builders' steam derrick or crane, high aloft, often over the heads of the passers by underneath, conveying bricks from front to rear, or the long chain depending from the upper story of the warehouse, with its ascending or descending loads, seems to be left to the supervision of Providence alone.

It is not intended to suggest a remedy for this state of things, but simply to bring under force the wear attending the use of chains, and point out the cause for such.

Visible and Invisible Wear of Chains.—There are two kinds of wear, which, for the want of a better title, we will designate as determinate and indeterminate, or visible and invisible, and both are the result of motion with weight. Both wears are contemporaneous, but not equal. The determinate wear is principally confined to certain localities or parts only, and can be looked for with certainty as being the results of simple or complex movements, which more or less alter the shape and size of links by abrasion, distortion, or weight, and can only be effectually dealt with by removal and substitution.

Indeterminate wear is unseen, and is the result of weight and move-

Fig. 2.—Showing Bad Weld

Fig. 1.—Showing Wear at Sides of Links.

Fig. 3.—Link Worn at End Only.

Fig. 4.—Wear at Sides of Links.

Fig. 5.—One Link Only Worn.

Fig. 6.—Showing Links Drawn In.

ment, acting and reacting on the organic structure in such a manner as to produce a slow but sure change from the fibrous—which should be the normal condition—to the molecular or crystalline condition. The phases of these alterations are irregular in proportion to the irregularity of the stresses passing through and the portions or sections of chain acted upon. This physical and chemical change is assisted by changes of temperature. Indeterminate wear can be dealt with by periodical annealing.

Determinate wear is always greatest in ill designed machines *per se*. Acute knuckling motion of links passing round pulleys of two small diameter readily suggests the importance of larger diameter pulleys; indeed, it should be an axiom of crane makers to lead the chain from one straight line to another by as large a radius as practicable, so as to reduce articulation of links as much as possible. Pulleys with too large a hollowed race or channel for the chain are responsible for a canting or rolling motion, which causes twists to form and rapid local wear. This, too, suggests the expediency or wisdom of using the grooved shaped pulley whenever possible. At all events, it may be understood that the greater the number of pulleys the greater the wear. These items, important in themselves, are simply proofs that wear is often produced, not so much by work done as the variation in the position of the links when doing it. Twisted chains—*i. e.*, chains defectively made with a twist—as also others which have become twisted by mismanagement, evidence determinate wear with great rapidity, and so localized as to render it very dangerous. At times a badly twisted chain, say from ¼ to ½-inch twist, will, in spite of the best lubrication and management, reduce the life time by one-half. The shorter the twist the greater the local wear, and *vice versa*. It is the righting of the twisted portion under weight which causes the mischief, for with the most effective oiling the chain may be not one iota the worse in the straight parts and be worn dangerously at the twisted portion.

Wear Affected by Construction.—There is another wear not produced by actual work, but by the return of the unloaded chain for the next lift, rubbing against surfaces, and caused by the want of proper guide pulleys. This wear affects the sides of links only, but is none the less very serious, see Fig. 1. The wear of chains is materially affected by their construction. This should be the better understood, seeing that every link represents a weld the soundness of which can only be proved by absolute wear. The guarantee tests are certainly very valuable, but not to the extent generally supposed. Chains which have been guaranteed and certified as tested have under normal loads been known to separate at welds, disclosing superficial welds—*i. e.*, only the outer edging of scarfing having been united, and the middle black, as shown in Fig. 2. Fortunately it is a very rare occurrence for a chain to break at the sides of the links. The ends not only exhibit the principal wear, but furnish over 90 per cent. of the fractures. Now, assuming the material to be only moderate, and the workmanship the same, it is easy to see that the results are in proportion. The bending of the links to the right curvature at the ends with such material, and with an imperfect heat, would be sufficient to impair permanently the fiber at the outside or point of greatest distension, but really in all cases of sharp bends the damage is greater on the inside, where the crushing together crowds the fiber out of shape, or in other words dislocates them, and it must not be forgotten that it is at these points that the most punishing strains are applied. The welding may be all that can be desired, and the wonder is that so few are bad, but there are peculiarities in the socket wear of chains, not breakages, which suggest that the same hand has not been equally sure. The rapid wear at one link of a chain, or at one end of a link, see Fig. 3, working under precisely similar conditions to the other, can have but one solution—viz., the link in question by more or less hammering at doubtful temperatures has become softer, or spongy.

Wear to breakage is largely due to socketing, see Fig. 4, but in proof of isolated wear it is occasionally found that one link only of the two so engaged is badly socketed, see Fig. 5; but as this rarely occurs, socketing is fairly represented by equal wear, not of all links, but of the two links engaged. Before ever the stage of attenuation has been arrived at as shown, a disintegrating force has also been at work, and it is simply due to the margin allowed that the chain has not come to grief. Socketing is very largely due to want of lubrication, and to extra movement at that part of link, and it may safely be claimed that such extraordinary local wear is often the result of a combination of evils.

Defective Welds.—Defective welds are of two kinds—viz., those where scale or dirt intervenes and prevents a portion of the surfaces coming into contact, and others by a deficiency of temperature, causing only partial union, and not a true welding of the two surfaces. The former are the most difficult to detect, as the process of hammering out the scarfs, as a rule, leaves the surface a little hollow, causing the edges of the scarfs to unite, and imprisoning the dirt or scale in the hollow formed by the convex face of hammer. The writer has known such defective welds to defy the closest examination by glasses, and in one instance where the chain—a very heavy one—had been certified as duly tested, and guaranteed, it broke at a much lighter weight than that for which it was specified—and no wonder, for the weld was so very partial as to comprise but a fraction of the area of the weld, representing a complete ring, but in width less than 1-16 inch all round, inclosing a black area of hammer marks. The latter welds—viz., those attempted at imperfect temperatures—are, in spite of the means adopted to hide them by hammering, as a rule, observable, owing to the edges not uniting. This view must not be taken as arbitrary, for the edges of the scarfs cool down quicker than the body, and sound welds often display suspicious edges.

Indeterminate wear is not general throughout the length of chain, but is even more localized than outside wear, being subject not only to the same influences which produce outer wear—viz., weight and motion—but also to differences of temperature and vibrations, shocks, etc., which mostly affect those portions of chain which receive the most movement. For example, the portions most affected are those

nearest the quick running pulleys, and the least affected are those which are on drums or slow moving pulleys. The influence of cold on the cohesion of chains is very remarkable, and should be taken seriously into account in cold weather or in cold countries. Fortunately, in spite of the insidious and dangerous character of the unseen wear, it can be dealt with much easier and mose generally than determinate wear. The process of annealing, or, in other words, restoration, is so easy as to come within the range of every user of chain, although the easiness of the process may cause it to be carelessly done. Annealing can be accomplished in a furnace, but the temperature should never be more than that represented by what is known as red; any higher visual temperature may produce scaling, which would be loss.

The chain during annealing should remain at the red heat for at least two hours, and when removed be put to cool gradually in a sand or ash bath. When a furnace is not available an improvised grid, composed of iron bars, each bar from 1 to 2 inches apart, with the ends resting on brick supporting walls from 2 to 3 feet high, can be built in the open, and the chain laid thereon, coiled in such a manner as to become pervious to the heat, built both under the grate and above, with wood fagots, maintaining the fire until the proper heat has been obtained. The result will be satisfactory.

For the making of chains, the shape and length of links are points of great importance. Long links when used on pulleys of small diameter undergo more motion—knuckling action—and consequently more wear than the short ones, besides taking up more strains. On the other hand, it is equally certain that a chain composed of longer links has a less number of welds than one of equal length composed of shorter links, and consequently less liability of defective welds. Therefore, the length of links should be carefully proportioned to give the minimum of articulation without unduly increasing their number or rendering them too short for sound welding. Chains in use always become longer, not alone in consequence of wear at points of touch, but also due to elongation or lengthening of links, produced by sudden strains and heavy work. A chain when properly proportioned for a certain weight should practically recover itself after such elongation, and no better proof is required that the elastic limit of the chain has not been overstepped. Wherever serious permanent elongation of such a chain has taken place it may be safely assumed that it has been subjected to rough usage, or that the proper weight has been largely exceeded. These points lead us to the question of what constitutes a properly shaped link to give the needful recovery after proper use. Now a chain which has received violent treatment beyond the elastic limits is always narrower and longer in the link than previously, and one of the peculiar evidences of such treatment, and particularly noticeable in light chains with long links, is the indrawn sides of the links, which in severe cases become narrower than the diameter of the iron, and hold each other in a vise like grasp, Fig. 6, and the chain is practically inarticulate and no longer workable, but when this occurs it proves conclusively that the material is at least good. The indrawing is merely the disposition of the sides of links to follow in the line of forces which pass through the other engaging links. Such goes to prove that the sides of links should never be parallel unless unavoidably required, and each side should form an easy radius.

The lubrication of chains, although long practiced by many, is not the unqualified benefit supposed. In some instances this want of success is due to the system pursued, and in others to the lubricant used, but mainly both system and lubricant are faulty. The application of lubricant to a chain at full stretch, in position, is at best a very imperfect one, as the points of contact of the links are so small that but a slight weight precludes the ingress of the oil. Again, oils or grease with good viscosity lack the fluidity necessary to get to the points named, and if rendered fluid enough to do so no longer possess the needful viscosity to benefit, and are easily excluded with light weights.

Should the chain be well worn—*i. e.*, socketed at the linking points—the surfaces become so close as to prevent ingress. Effective constant lubrication can never be obtained, as all sudden accessions of weight on such small areas of touch are sufficient to destroy the oil film and cause metallic contact and abrasion, so that partial lubrication under the most favorable circumstances is only obtainable, and that too by adopting the best plan—viz., periodically lowering the chain into a barrel of grease or oil of the proper consistency and viscosity to enable the unguent to have access to every part.

A limited elasticity is one of the needful requisites of a good chain. Without elasticity it becomes little better than a solid bar under weight; therefore the form of the link has much to do with the longevity of the chain. If the links be too long and too much of the oval the elasticity, providing the chain be duly proportioned, would be too great and beyond recovery; but with medium size links of the semioval pattern the elasticity would be such as to take off the severe shocks consequent upon quick lifting without seriously impairing their form.

Stresses on Chains.—The stresses to which chains are subjected as a rule come very irregularly, and it will be readily understood that they are exactly in proportion to the load in the case of a hand crane with slow movement and direct lifting without lurch or click, but with steam or hydraulic cranes, running at a speed much beyond that of hand lifting, it is impossible to estimate them by the weight lifted. Every lurch in the weight, every little click or adjustment of the chain, either in the pulleys or drum, causes a slight increase of weight, The lifting or stopping with speed has its immediate action on the chain. and it is amusing how the needle of the dynamic register, when used, is incessant in its movements during the quick lifting or lowering of moderately heavy weights, so that the normal elasticity of a chain stands as a reservoir of absorption to diminish these acute differences. A powerful brake mounted on an axle, so stubborn as not to show the slightest tendency to torsion, is one of the most effective agencies for the destruction of chains. A sudden application of a brake of this character does more harm to the internal and external wear than almost anything else, and it is only the native elasticity of the well proportioned and made link that can for any length of time stand against this trying ordeal.

Chains with small links are subject to much more friction than chains of medium sized links, although made from the same iron as the long links; such chains are by necessity stubborn, and although apparently equally as strong are really more liable to break, owing to the greater difficulty of making sound welds; in short, links of strong material.

The molecular change or transition from the fibrous to the granular form, though it be slow or quick, is but a constant wear in proportion to the amount of work done and influence of the surroundings, and as the change progresses it only becomes a question of time to reduce the normal cohesion to such an extent as to render the chain no longer able to perform the work without breakage. Literally falling by exhaustion, therefore, it must be considered as wear. This internal wear is always the more rapid where the conditions of irregular weight and working exist. An ill adapted chain, where the links are not proportioned to the pulleys or barrel diameter, or badly shaped pulleys on which the chain never secures a proper seat, noisy and clicky work, are always very unfavorable to longevity, particularly where the chains are also subject to excessive cold or sudden great changes of temperature. The more silently a chain works the better.

[Prepared for the JOURNAL.]

A Noteworthy Curiosity from the U. S. Patent Office.

By MR. FREDERICK EGNER, Norfolk, Va.

In the present article the author proposes to bring to your attention a process which has this to recommend it, that its alluring prospects have not only engaged the labors of the poor visionary seeker after untold wealth, but has further held at one period or another the close attention of the foremost chemists of our time. Adding to this the statement that under its claims fairly good combustible gas can be made in large quantities for less than nothing, since the gas is merely an unavoidable by-product in the course of the otherwise very profitable manipulation of the materials employed—coal, oil and lime—the presentation of the subject in these columns may be readily excused.

To this the writer would add that, having given the process considerable attention and close study some eight years ago, he was then impressed that nothing but a practical demonstration was required to prove the process all it claimed; for, theoretically taken, there could be no doubt of its entire feasibility. The latest exponent of this subject may be found in the records of the U. S. Patent Office, when, on July 26th last, a patent for "Method of Producing Ammonia" was granted to Herman Mehner, of Berlin, Germany. In the present article, however, I will confine myself to what is known by its familiars as the "Fogarty Process," the claims of which are set forth in U. S. Letters Patent, Nos. 500,650 and 500,651, both of July 4th, 1893.

The Fogarty idea was the basis of several earlier patents, not necessary to specifically mention here, since they were proved abortive. In connection with this matter it may be remarked that, if the records of the U. S. Patent Office were carefully searched, not only would many interesting curiosities be found, but that the adage, "Truth is stronger than fiction," would receive additional confirmation, and it is more than probable that some treasures might be discovered there which only lacked the magtc touch of capital to make them splendid realities.

Gas engineers and superintendents seldom have time to delve in search of such, after all, more or less problematical matter; sometimes they have not the inclination, and frequently neither the one nor the other. Thus it happens that some deserving things at times receive scant recognition, and are forgotten and remain so, unless some fellow with more leisure than anything else maybe, to keep from getting rusty or to go to pieces altogether, resurrects them, and, aided by an indulgent publisher, presents them to patient readers, with what result or appreciation it would be hard to guess. Once in a while a good thing is re-invented after having remained dormant for many years; and under another guise attains to that success which was impossible before because of its too premature presentation on the former occasion. It will not be so difficult for the intelligent reader to call to mind instances where such was the case. Such was the case with the "Inclined retort," for instance; and water gas was not the newest thing under the sun, as the student of the subject knows.

The fact that ammonia and cyanides could be produced by the combinations proposed by Mr. Fogarty was well known to every chemist; but, like the carbide of calcium, from which acetylene is now evolved on a commercial scale, it was overlooked by the many, no doubt because of the immensity of the field of chemistry with its thousands upon thousands of accomplished facts and future possibilities, which are far too great for any human brain to grasp. But Mr. Fogarty invented certain methods or process and apparatus by means of which he claimed to have accomplished the synthetical production of ammonia and cyanides. His "Synopsis of the Practical Results Claimed for the Fogarty Gas and Ammonia Process," will give the reader a better idea of what Mr. Fogarty claimed than the specifications of the patents previously mentioned, and the writer will, therefore, quote it in full.

Said Mr. Fogarty: "The object of the process is the joint and simultaneous production of gas and ammonia. It is equally applicable to the production of both fuel and illuminating gas. The ammonia produced is derived from the nitrogen of the air, while the gas may be regarded as a by-product incidental to the ammonia manufacture. The expense of the joint manufacture of these products cannot possibly be distributed between them, and, consequently, a study of the economy of this joint production cannot be limited to an inquiry into the separate cost of making either gas or ammonia. They are a joint product, and consequently, to be of any value, an inquiry into the economy of the process must take into consideration the entire expense of their joint production. The gas and ammonia are produced simultaneously by a joint and continuous process.

"*Fuel Gas.*—1 ton (2,240 pounds) of coal will produce 1,000 pounds of sulphate of ammonia and 60,000 cubic feet of fuel gas. As nearly as I can estimate it, the entire cost of both gas and ammonia will be about $12. One thousand pounds of sulphate of ammonia are now[1] worth $31; but it is admitted that this price cannot be maintained in the face of a very large production. Put the price of 1,000 pounds of sulphate at $20, below which it cannot possibly fall, and the result will be $20 — $12 = $8 in money, over and above the entire cost of both gas and ammonia, *so that the gas will cost nothing at all.* The composition of the fuel gas produced, and the calorific value of 1 foot, will be approximately:

Hydrogen	47.10	per cent.	× 3.44 =	162.02	heat units.
Marsh gas	0.40	"	× 10.75 =	4.27	"
Carbonic oxide	27.88	"	× 3.43 =	95.62	"
Carbonic acid.	0.40	"	....	.....	
Nitrogen.....	24.22	"	....	.....	
Totals	100.00	per cent.	....	261.93	heat units.

"*Illuminating Gas.*—1 ton (2,240 pounds) of coal will produce 1,000 pounds of sulphate of ammonia, and 37,500 cubic feet of 25-candle gas. The entire cost of both gas and ammonia will be about $14.[2] Estimating the value of the sulphate of ammonia at $20, as before, *the gas will cost nothing at all*, and there will be $20 — $14 = $6 in money, over and above the entire cost of making both gas and ammonia.

"It does not need many arguments to prove that, if these results can be realized in practice, *the process presents the only solution yet offered of the fuel gas question.*

"I have proved the practicability of the process, and on a good, large scale, too, so very frequently as not to leave a shadow of doubt as to its entire practicability.

"The approximate composition of the illuminating gas, and the calorific value of 1 cubic foot, will be about as follows:

Hydrogen	45.3	per cent.	× 3.44 =	155.8	heat units.
Marsh gas	0.4	"	× 10.73 =	4.2	"
Carbonic oxide	24.0	"	× 3.43 =	82.3	"
Illuminants...	17.7	"	× 16.82 =	297.7	"
Carbonic acid.	0.5	"	.....	.....	
Nitrogen.....	12.1	"	.....	.....	
Totals	100.0	per cent.	.....	540.0	heat units.

"The above fuel value will compare very favorably with that of Siemens gas, which usually contains from 95 to 115 heat units in 1 foot.

"The above estimates have relation merely to the amount of coal used (1 ton of 2,240 pounds), without entering into the details of cost or of the other materials used. These have all been tabulated, and will be furnished if desired."

Since patent specifications are mostly very dry reading, I will, in this instance, give the "Claims" only, which will indicate to the reader the manner in which Mr. Fogarty proposed to accomplish his purpose. Should anyone be sufficiently interested to pursue the subject further, the sum of 5 cents sent to the Patent Office at Washington is all that is required to get copies of any of the specifications of any patent desired. In number 500,650, Mr. Fogarty claims as his invention:

"The process herein described of producing alkaline cyanides and ammonia, by burning carbonaceous matter in a limited supply of air alone, or air and steam mixed, producing a generator or producer gas, consisting chiefly of the oxides of carbon and free nitrogen and hydrogen, causing said gas to meet and mingle with hydrocarbon gases or vapors, and the mixed gases or vapors to pass through a heated chamber, and then bringing them into admixture with a pulverized mixture of alkali and an infusible substance, as carbon, and moving or falling through the chamber in the same direction as the gases, causing the hydrocarbons to be decomposed by heat into simpler and elemental products, and these to combine with the nitrogen and alkali producing alkali cyanides, ammonia and fuel gases, substantially as described."

The second claim of this patent may be omitted without loss to the reader.

Patent No. 500,651, gives a better description of the apparatus proposed than the former one. In it are shown a steam boiler, water gas generator, converting (or ammonia, etc.) producing retort—which is quite an elaborate affair apparently—and a wash box and scrubber for the recovery of the principals produced. This patent contains six distinct claims, the first of which, however, will give one a sufficient idea of the process. It states that: "Without limiting myself to the precise processes or succession of processes, actions and reactions described, or to the exact form and arrangement of apparatus shown, I claim:

"The process herein described of producing cyanides and ammonia, consisting in producing a gas consisting chiefly of oxides of carbon, free hydrogen and nitrogen, passing the same into and through a suitable retort maintained at a high or incandescent temperature, passing simultaneously through the same retort, and in the same direction as the before described gas, suitable volumes of hydrocarbon gas or vapors and of alkali or alkaline earth or vapor, decomposing the hydrocarbon gas or vapor by heat into acetylene and free carbon and hydrogen, and causing these to combine with nitrogen and alkali, and to produce alkaline cyanides, ammonia and fuel gas, substantially as described."

The pith of the whole process is to be found in the evolution of *nascent* carbon and hydrogen, which in that condition will make the combination with it of nitrogen possible; and that that is possible admits of no doubt whatever.

Nevertheless, with all these facts to recommend it as to its feasibility, and (as the writer is informed) the further fact that large sums of money have been expended under the inventor's own direction, the "practical demonstration" referred to by the writer of this article, when quoting his own opinion relative to this process, seems still one of those things which has to be made.

By a practical demonstration the writer understands a demonstration on a commercial basis, which so far as I am informed, has not yet been accomplished; but if so, the information would be gladly acknowledged by all those interested in the gas industry.

Within the past quarter of a century the gas industry has had some setbacks, besides being subjected to the modifying influences of certain radical innovations as well as improvements. For example; although it is the fashion to say the electric light has not hurt the gas business, because, despite the considerable adoption of the former the latter has not ceased to grow, yet but for the electric light the increase must have

1. This was seven years ago.
2. Mr. Fogarty here figured on using 6 gallons of Lima oil, at 2 cents per gallon, per each 1,000 cubic feet of gas.

been still greater. The incandescent gas burner on the other hand, though it certainly does largely decrease the quantity of gas required to produce a given amount of light, is a most valuable ally, and could be made much more so if its known properties were really and entirely taken advantage of, which they are not.

For instance: What is the use of gas companies spending *millions of dollars* to make a very high grade candle power light, which, at its best, cannot give the illuminating power the Welsbach burner gives with a non-luminous though heating gas, and then the consumer, after paying the gas company its just price for said high candle power gas, promptly reducing this illuminant to nothing at all, in order that he may use it with the excellent Welsbach, which would not be able to give the results it does unless the rich gas was first reduced. Now, if only the Fogarty idea *could be* commercially carried out, what a boon to some gas companies and consumers likewise? Anyhow, here is something to think about; or to go to sleep with?

Recent Progress in Self-Lighters for Incandescent Lamps.

The *Gas World* reports that, in a paper read by M. Syssoyeff before the French Society, the author remarked:

A great advantage possessed by electricity is the ability to light it from a considerable distance. In warehouses, theaters and public lighting, the necessity for simplifying the method for lighting the lamps is recognized, and for such places electricity has been preferred by reason of this facility in lighting. The first results of investigations in this line have far from attained the practical solution desired. Pilot lights of very small consumption were first tried on the burners of street lamps. Recourse was also had to the use of a small cap detonator, exploded by electricity, and thus lighting the gas. These two methods were neither practical nor economical, and discouraged further tests in this direction. Some time thereafter incandescent gas lamps came into use, which required care in lighting. The idea was then advanced to light them by means of an electric current, either the spark from a secondary coil or the high heat of a thin platinum wire in the main direct current circuit. They commenced by opening the gas cock of each isolated burner by hand and igniting by an electric spark, and some of these secondary current devices are quite well developed. Four years ago, however, tests were begun, having for the object not only the igniting of the gas, but also to utilize the electric energy in opening the gas cock; and this constitutes what is called distant lighting by electricity.

Notwithstanding the relatively short time since the inception of the idea, a hundred devices have been brought out, more or less expensive, and nearly all subject to frequent derangement, but which have met with some application. Without doubt they are amenable to being perfected; but they are restricted to very narrow limits by the special conditions of construction, which demand that it occupy as small a space as possible, and that it be a complex mechanism, made with considerable delicacy, which will fulfil the double function of opening the gas admission and at the same time raise the temperature sufficiently for lighting. With time these difficulties may be lessened and the price decreased. Independently of the apparatus itself, there is the necessity for a source of electric energy, of which the conductor is always subject to accidents and breaks or leaks. It would, hence, seem that this is not the solution of distant lighting.

Recently some inventors followed another method. They knew that platinum sponge in contact with hydrogen mixed with air became incandescent and ignited the gas. As illuminating gas contains nearly 40 per cent. of hydrogen, the idea occurred to them to light by an analogous method. Experience, unfortunately, showed that illuminating gas, although carrying to incandescence the platinum sponge, did not ignite, and that after the sponge had been subjected frequently to the action of the gas, it ceased to become incandescent. To overcome these two obstacles was, hence, the problem to be solved, and for the past two years numerous patents have been taken out which, according to their originators, accomplish the object. Submitted to a serious examination, all these inventions show that they are but the first step in the field of these investigations. The inventors, however, are in perfectly good faith, and this is joined to an unlimited optimism.

They first attempted to prevent the rapid wasting of the platinum by means of meerschaum. It was hoped that the increased porosity thus obtained would increase the surface of contact of the gas with the metallic particles and thus produce a stronger reaction. Meerschaum, being a poor conductor of heat, was supposed to protect the platinum from the heat or from the flame produced. This was a step on the road of progress. The small platinum globules required some time to act, but they ignited the flame. To attain this result, one introduced a very thin platinum wire, which is well known to attain about 300° C. under the action of gas, and thus the gas could be ignited. This was the subject of the patent applied for in England by Duke, and which has been used in England and France under the name of the Cannellopolus.

These tests were not of long duration, and the results might have been foreseen. The platinum wire, under the action of the flame, became very fragile, and was used up in a short time; the meerschaum balls rapidly fell apart under the action of heat. Methods were then looked for to preserve these from the action of heat, and to so dispose them as to light the gas indirectly, by the intervention of a lighter which was extinguished as soon as the flame was ignited. A new apparatus built on this principle appeared a short time ago under the name of the Self Lighter, which is very ingenious and well worked out. Automatically, upon opening the burner, this apparatus conducts the gas through a lighter which is furnished with a ball of platinized meerschaum at its end, attached to a fine platinum wire. The access of gas to the burner itself remains closed until the heat of the ignited lighter expands a platinum wire, which opens a special valve to which it is attached, allowing the gas to pass into the burner itself and there to be ignited by the lighter. The end of the platinum wire is thereby heated upon one side by the heat of the flame of the lighter, and upon the other by the stronger one of the burner, under the influence of which it dilates still more strongly, and closes the valve of the lighter completely. As can be seen, this apparatus is very cleverly constructed; but in practice it presents more serious disadvantages than its prototype with the platinized meerschaum and the platinum wire. Its mechanism, being very delicate, requires careful handling; it is too difficult to repair for use in public lamps, and the average user cannot be depended upon to regulate and keep the platinum wire adjusted. The wire not only becomes brittle, but changes its coefficient of expansion under the action of heat, and thus causes irregularities in the openings of the valves, and consequent unsatisfactory working of the apparatus. Further, a great part of the apparatus connected with regulating the tension of the wires is of porcelain and very fragile. It is true that these fragile parts cost little, but they must be renewed by skilled labor. The public requires extremely simple apparatus, requiring neither regulation nor repairs for a certain length of time. It must also be considered that the selling price of this complicated burner is about $1.50, and this is a serious item where a large number are wanted, as is the case where self lighting burners are most needed.

The ideal arrangement will be that which is entirely free from mechanism—that is, the incandescent mantle should itself light the gas. The chemical composition of the body of the mantle should fill this office, and this is the basis of the idea that a Lyons inventor believes he has now perfected.

We have already mentioned that platinum sponge gradually loses its incandescent properties by prolonged usage, due to a double source of heat, caused either by the flame or chemical reaction. It is hence necessary to find another substance more resistant to the action of heat than platinum and possessing the same property of becoming incandescent under the influence of gas. Platinum possesses the highest point of fusion of all common metals. Palladium belongs to the same group and seems to possess the same property of becoming incandescent upon contact with gas, although it has a much lower melting point, but one would not think of substituting palladium sponge, so that it is necessary to look for other chemical substances. To the same group belong iridium, rhodium, ruthenium and osmium, the last two being the rarer and having properties not well determined; and there may be still other metals of which we are as yet ignorant. As to osmium, it possesses the highest melting point of the group, as seen in the following table:

Metal.	Melting Point.
Palladium	1,500° C.
Platinum	1,750° C.
Rhodium	1,900° C.
Iridium	2,000° C.
Ruthenium	2,300° C.
Osmium	2,750° C.

The flame of an incandescent gas burner is not over 1,450° C. Although the fusion point of palladium is above the temperature of the Bunsen flame, we must remember that before a substance melts it begins to soften and compact itself from a spongy to an agglomerated mass, which is not at all to be desired. Moreover, under the influence of high temperatures and a constant supply of gas the metal evaporates, at an almost inappreciable rate, it is true, but sufficient to modify the

physical structure, as was shown by experiments made upon platinum sponge, where this substance, after a short exposure to a Bunsen burner, completely lost its porosity. This is the secret of the failure of tests with platinum or palladium sponge.

Iridium and rhodium have a great advantage over palladium as regards the influence of heat, because these two substances, like platinum, under certain reduction conditions, form a metallic sponge like that obtained with platinum. But these sponges or mosses are much less energetic in their action than that of platinum, and become incandescent in contact with gas only at a high temperature, and thus could not be employed for the purpose in question.

Rhodium, if it did not have the disadvantage of partial oxidation at high temperatures, could replace platinum, by reason of its much higher melting point. As to osmium, its use alone is absolutely impossible, because at 100° C., under the influence of flame, it forms a very volatile oxide, which is poisonous, and attacks the eyes and respiratory passages. Such are the properties of the members of the platinum group.

It would seem that satisfactory results might be obtained by alloys. The general rule is, if we alloy metals of different melting points, the melting point of the alloy will be the mean of that of its constituents. This rule is subject to frequent exceptions, which one observes in metals of similar physical properties, and which make the ratio one-quarter to one-half. It is not rare in these conditions that the point of fusion of the alloy, instead of passing that of the metal the most readily fusible, presents, on the contrary, a fusion point many degrees below this. For example, tin solders are composed of one-third lead and two-thirds tin. The melting point of lead is near 325° C.; that of tin is 230° C. The alloy melts at 180° C. Again, the alloy known as Wundt metal, composed of tin (melting point 230° C.), lead (325° C.), bismuth (270° C.), and cadmium (320° C.), melts at points between 40° and 80° C. From this it will be seen that extended investigations were necessary to determine the melting point of the difficultly fusible metals.

It was with the aid of these elements, and after numerous tests, that an alloy was obtained having a point of fusion near 2,300° C., an alloy composed principally of platinum, of which the melting point was raised by relatively small quantities of ruthenium, rhodium and osmium. The substance thus obtained reacts very energetically, and does not disintegrate under the action of a flame for a long time. To increase its activity and render it completely stable, recourse was had to a refractory porous substance which was a poor conductor of heat. This porous substance is the substance of the mantle itself, which is of small weight, and resists the action of heat for many months without appreciable alteration in physical structure. By a special process the metallic alloy is incorporated with the substance of the mantle, especially in the head of the mantle. The turning on of gas causes the head of the mantle to become red hot, and the heat spread downward about one-third the height of the mantle, when ignition of the gas takes place.

If, instead of preparing the mantle from cotton threads of the usual size, one makes a smaller mantle of asbestos the size of a thimble, impregnating first with a thorium mixture, and then with a solution containing the alloy mentioned previously, a body is obtained which will ignite automatically any kind of apparatus, such as an incandescent burner, ordinary gas jets, and gas heaters or grates.

These bodies retain their properties indefinitely. The highly satisfactory results obtained by this inventor have already become very important, and the problem of lighting gas by chemical reaction, without any apparatus, appears to be solved. But as the specimens submitted are the result of laboratory work—are made by hand and without the use of machinery—it is quite possible that commercial development may greatly improve them. They can be made for about 16 cents apiece.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

Mr. E. C. Hathaway has resigned the position of Superintendent of the Capital Gas and Electric Light Company, of Frankfort, Ky., to accept a place of responsibility with the Charlotte Consolidated Construction Company, of Charlotte, N. C., which latter concern (it now operates the local electric light works) proposes to construct a gas plant, to be run in opposition to the Charlotte Gas Light Company. Mr. Hathaway will take charge of the construction of the plant, on the completion of which he will operate the same. The Company has planned for the placing of a 10-inch water gas system complete, and a gasholder, of the double-lift order, to rest in steel tank, with a capacity of 75,000 cubic feet, has been bargained for. The opposition Company proposes to charge $1.50 for an illuminating gas supply, the rate for a fuel gas supply to be $1.25 per 1,000.

The proprietors of the Peoples Gas Light and Coke Company, of Chicago, have informed the builders of that city that hereafter service pipes will be laid free only to the building line. Heretofore no charge was made for running the pipes from the street main to the consumers' meters. The plan of connecting up gas stoves free of charge will, however, be kept up.

The Riter-Conley Company, of Pittsburg, Pa., has been awarded the contract for the construction of a holder on the plant of the Allegheny Heating Company, the vessel to have a capacity of 5,000,000 cubic feet. The holder is intended to equalize the supply of natural gas to the residents of Allegheny during the winter months.

The following is the text of the decision of the Board of Gas and Electric Light Commissioners, of Massachusetts, in the instance of the application of the Massachusetts Pipe Line Gas Company for the right to issue $1,000,000 of "original" stock:

"This was an application by the Massachusetts Pipe Line Gas Company for the approval of an issue of capital stock of the par value of $1,000,000. The petitioning Company was chartered by chapter 537 of the acts of 1896, for the purpose of manufacturing, selling, dealing in, conveying, transporting and distributing gas for illuminating, heating, cooking, chemical and mechanical purposes. By section 3 of its charter the capital stock of the Company was fixed at $1,000,000, divided into 10,000 shares of the par value of $100 each. By Section 4 the Company was authorized to lay, construct, maintain, repair and operate its pipe lines and distributing system in, along, through, under and across or over any public ways, water courses, railroads, railways, canals, bridges or subways? On July 15, 1896, organization was effected under this charter, and the Company voted to issue the stock referred to in this petition. From the evidence submitted at the hearing it appeared to be the present intention of the Company not to manufacture, but to purchase, gas from the New England Gas and Coke Company, and through an extensive system of pipes, to distribute it for sale to other Companies, in accordance with the Company's powers, as defined in said Chapter, 537. A descriptive schedule and plan of the proposed lines and appliances appurtenant thereto were filed with the petition. The cost of the work thus described will probably exceed the amount of stock hereinafter approved.

"The following is therefore adopted: On the petition of the Massachusetts Pipe Line Gas Company, pursuant to the provisions of chapter 450, of the Acts of 1894, for the approval of an issue of 10,000 shares of a capital stock of a par value of $100, pursuant to the vote of the stockholders of said corporation on the 15th day of July, 1896, the same being the first stock authorized to be issued by said Company for the purpose of paying the cost of the construction of a system of distribution for the supply of artificial gas and the purchase of real estate for the use of the Company, after public notice and hearing it appearing that the amount hereinafter approved is reasonably requisite for the purposes for which such issue of stock is authorized as hereinafter specified: *Ordered*, That the Board approves hereby of the issue by the Massachusetts Pipe Line Gas Company of 10,000 shares of capital stock, at the par value of $100 each, the same being the capital stock voted to be issued by said corporation on July 15, 1896, and being the first stock voted to be issued by said corporation, the proceeds of said stock to be applied in payment of the necessary cost of construction of holders, mains, meters and other appurtenances constituting a distributing system for the supply of artificial gas and to the purchase of real estate reasonably requisite for the Company's use and for no other purpose."

The new proprietors of the Williamsport (Pa.) Gas Company are now virtually in control of that property. They propose to make extensive betterments to the plant, and although we are not absolutely certain that it has been so determined, it is more than likely the improvements will be carried out under the direction of Mr. James W. Lane.

We understand that the net rate for natural gas in Buffalo, N. Y., will be or has been advanced to 27½ per 1,000 cubic feet; an increase of 2½ cents per 1,000.

The inevitable has occurred at Kalamazoo, Mich., which means that another distinctively original fuel gas concern has gone to its doom. At least we believe such is the case, from the wording of the following clipping, forwarded by a correspondent, who wrote under date of July 29th: "A suit of foreclosure was filed in the Circuit Court, Kalamazoo

district, the last week in July, by M. B. Williams, Trustee, against the Kalamazoo Heat, Light and Power Company. Williams represents the creditors of the Company, the First National Bank, of Kalamazoo, and S. E. Hurlburt and C. E. Roberts, of Chicago, who loaned the Company several thousand dollars. The defendant, now known as the Kalamazoo Gas and Electric Company, has been operating a patented system for the manufacture of gas, which system, of course, was to revolutionize the gas makers' trade. Your readers, however, know how such revolutions usually go in the long run; and the experience at Kalamazoo is a further proof of the good, old, homely fact that you cannot have your cake and eat it."

THE National Gas and Water Company, of Chicago, has certified to a decrease of capital stock to $50,000, from $500,000.

THE Kenosha (Wis.) Gas and Fuel Company's new plant will be completed this fall.

ADVICES from Nashville, Tenn., are to the effect that Mr. T. G. Littlehales has leased all the properties and privileges of the Hopkinsville (Ky.) Gas Company, the agreement to cover a period of five years.

THE Ordinance Committee of the Ironton (O.) City Council has reported in favor of the proposition to extend the franchise of the Ironton Gas Company for a term of 25 years, the extension to date from December 20, 1899. The impression prevailing there is that the Council will only agree to an extension not exceeding 10 years.

THE Chelsea (Mass.) Gas Light Company has elected the following officers: Directors, Jabez K. Montgomery, A. D. Bosson, George W. Moses, Thomas Martin and Francis Low; President, J. K. Montgomery; Vice-President and General Counsel, Albert D. Bosson; Treasurer and General Manager, Geo. W. Moses.

COLONEL CARTER M. BRAXTON, who was prominent in the formation of the Newport News (Va.) Gas Company, died at his home in Newport News the morning of July 28th. Deceased, who was born in Norfolk, Va., September 5th, 1836, was noted for his skill as an engineer, and respected for his unswerving observance of the practices that guide honest men.

RESPONDING to an invitation to tender for the public lighting of Washington, D. C., by gas, the Washington Gas Light Company proposed to maintain any required number of gas lamps, on the basis of an all night and every night schedule, at the rate of $20 per post per annum.

THE Pittsburg (Pa.) *Commercial Gazette* of recent date had this to say: "Philadelphia (natural) Gas Company stock has advanced about $3 per share during the past 10 days on very light sales. The stock closed at the third call yesterday (July 25th) at 33½ bid, 33⅝ asked. The sharp advance was based upon a report that a meeting of representatives of the Consolidated Gas Company, of Pittsburg, and of the Philadelphia Company, had been arranged, at which terms for a combination of the natural and artificial gas and electric companies would be discussed."

AT the annual meeting of the Fall River (Mass.) Gas Company the officers chosen were: Directors, John S. Brayton, Joseph A. Baker, C. M. Shove, Geo. P. Brown, Samuel T. Bodine, Randall Morgan and Walton Clark; President, John S. Brayton; Vice-President, Joseph A. Baker; Clerk and Manager, Geo. P. Brown; Treasurer, E. C Lee; Superintendent, Joseph E. Nute.

A CORRESPONDENT, writing from Yonkers, N. Y., under date of July 30th, forwards the following clipping from the White Plains (N. Y.) *State Journal*, of like date: "It will be a surprise to White Plains to learn that the plant of the Citizens Gas and Electric Company, of this village, was transferred on July 25th to the new Electric Lighting Company. The new Company is composed principally of Eastern blood and capital. It controls numerous trolley lines and lighting companies. The new electric railway at Port Chester is under its management as are the lighting plants at Stamford, Waterbury, Norwich, New London and other Connecticut towns. It is evidently manned by a progressive organization of business men of nerve, ability and capital, headed by Mr. W. G. Bushnell, of New Haven, Conn. Mr. Bushnell says it is the purpose of the new organization to improve the service here, both as to quality and quantity. The plant will have all the modern appliances added to it necessary to afford the best of satisfaction to the public. The people are looking forward to a fulfilment of these promises with an anticipation of the benefits so to accrue."

THE Directors of the Malden and Melrose (Mass.) Gas Light Company have recently issued a circular to the shareholders of the Company, which for a plain statement, based on the truth and nothing but the truth, is most commendable. The intent of the circular is to prevent the ordinary shareholders from disposing of their holdings to the stock jobbing concern of Hildreth Brothers, unless the latter give to the former a price pretty close to what the stock is intrinsically worth. The Messrs. Hildreth offer "not less" than $135 per share, whereas the Directors declare that "control" in the stock is worth $150 per share. To prove they are right the Directors propose to "pool" a control in the stock at the figure of $150 per share; and at 150 the stock seems to us a bargain for the purchaser. If we owned any of the M. & M. Company's shares the bid of $150 would not part us from our holdings. Under the peculiar conditions existing in the Company's district, $175 per share would not be too high; for good charter privileges are worth much money. For instance, all Massachusetts gas investors would do well to remember what the values of the Brookline Company's rights were.

AT the annual meeting of the Northampton (Mass) Gas Light Company the officers chosen were: Directors, Messrs. John W. Starr (Camden, N. J.), Clark Seelye, C. N. Clark, D. W. Crafts and E. H. Banister. President, C. N. Clark; Treasurer, E. H. Banister; Superintendent, D. W. Crafts; Assistant Superintendent, H. C. Crafts. The annual reports showed a most satisfactory increase in the Company's trading for the year (during the past twelvemonth the output amounted to 22,000,000 cubic feet) and that the expenditures, on account of keeping the plant in good working condition, had been in no sense skimped. Mr. Crafts is now engaged in completing the reconstruction (on a much enlarged scale) of the Company's purifying house and its concomitant plant.

THE proprietors of the Gloucester (Mass.) Electric Company are before the Board of Gas and Electric Light Commissioners for the right to issue an additional $50,000 in bonds.

AT the annual meeting of the Beverly (Mass.) Gas and Electric Company the officers chosen were: Directors, Sidney W. Winslow, Andrew W. Rogers, Freeman N. Winslow and Charles F. Prichard; President, S. W. Winslow; Treasurer and Clerk, A. W. Rogers.

AT the annual election of the Lowell (Mass.) Gas Light Company, this result was reached: Directors, Sewall G. Mack, Levi Sprague, Jacob Rogers, Alex. G. Cumnock, Geo. S. Motley, E. M. Tucke and J. Francis; Clerk, S. E. Rogers; Treasurer, Jacob Rogers.

The Theoretical Aspects of Acetylene Manufacture.

The *Journal of Gas Lighting* "notes" that an article in the *Engineer* discusses the theoretical aspects of acetylene manufacture. It is admitted that until such time as the price of calcium carbide shall be so far reduced that the cost of acetylene lighting is very greatly below that of intelligently burnt coal gas as delivered to consumers in cities —a consummation more to be desired than expected—there is little prospect of the former being adopted by individual urban householders. With reference to the protective office of the odor of the illuminating gases, coal gas and acetylene, it is remarked that "the nose becomes habituated to the smell of coal gas after a time—fatigued or paralyzed, perhaps—since country people usually affirm that they can detect gas in every town house, just as citizens notice the odor of paraffine in every country village." It is questioned whether fatigue of the nose would occur so soon with acetylene; "for the latter generally causes a distinct headache as well as a sensation of disgust." With regard to the preparation of acetylene from calcium carbide for domestic lighting, it is advised that some sort of purifying arrangement should always be used.

Without going deeply into the details of the acetylene generators now being offered to the public, and many of which are described as "automatic," it is observed that the only safe principle to work upon is that of controlling the supply of carbide to the water. "The ordinary plan for governing the make of gas is to admit the second ingredient of the active mixture through a valve worked by the rise and fall of the holder bell;" and as it is obviously easier to treat a liquid in this fashion than a solid, this is the reason why so many generators admit the water to the carbide. This principle is only suited to the smallest sized apparatus, designed to consume but a few pounds of carbide. It is suggested also that every generator, automatic or not, should be provided with a holder capable of containing 50 per cent. more gas than can be evolved from the weights of the active substances ever brought together at one time.

THE AMERICAN
GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

THOS. J. CUNNINGHAM,
ELBERT P. CALLENDER,
EDITORS.

CHAS. E. SANDERSON,
MANAGER.

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MONDAY, AUG. 8, 1898.

The Market for Gas Securities.

The activity noted last week as ruling in the city gas share market is still in evidence, and the increased trading was mainly done at better prices. The quotation for Consolidated today (Friday) at the opening was 199 to 200. During the week the shares sold a fraction above 201, and there is no doubt that small lots of cash stock are being picked up, whenever the opportunity for such absorption offers, by the same set of skirmishing brokers. We repeat our hint of last week to the effect that this month is likely to be an important one in respect of interesting developments in the local gas situation; and we unhesitatingly advise the purchase of Consolidated gas, the New Amsterdam issues and Standard common, at the quoted rates. Mutual was prominent in a five point advance, and New York and East River first 5's were often inquired for. Northern Union bonds have also been in demand sufficient to lift their price a couple of points.

Brooklyn Union showed some activity, at advancing figures. The rate bid to-day at the opening was 123 to 125¼. Peoples, of Chicago, is virtually at the figures of last week, although between times it sold something above par. Consolidated, of Baltimore, is steady, and it cannot be truthfully denied that a quiet and persistent purchase of that Company's shares is being made by a firm that usually acts in such trades for a capitalist, much of whose money is invested in healthy gas undertakings. Consumers, of Jersey City, is at 78 to 85, and our opinion is, considering the peculiar deals that are now on in East Jersey gas properties, that par or over would be much nearer its real value. Bay State "holds steady, at 4, or thereabouts." The fact that the Massachusetts Board of Gas and Electric Light Commissioners consented to the issue of $1,000,000 stock by the Massachusetts Pipe Line Gas Company does not seem to have made much difference in the value of Bay State "securities." The outlook is in favor of better prices all round.

Gas Stocks.

Quotations by Frederic B. Cochran & Co., Brokers and Dealers in Gas Stocks.
20 AND 22 BROAD STREET, NEW YORK CITY.
AUG. 8.

☞ All communications will receive particular attention
☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$36,230,000	100	199	200
Cental Union, Bonds, 5's	3,000,000	1,000	99½	100
Equitable Bonds, 6's	1,000,000	1,000	105	..
" 1st Con. 5's	2,300,000	1,000	114	.
Metropolitan Bonds	658,000	.	108	112
Mutual	3,500,000	100	335	340
" Bonds	1,500,000	1,000	100	102
Municipal Bonds	750,000	.	..	
New Amsterdam Gas Co.	13,000,000	100	31	31⅜
Preferred	10,000,000	100	75¼	76
Bonds, 5's	11,000,000	1,000	102¾	..
Northern	150,000	50	..	
" Bonds	150,000	1,000	..	
Northern Union, Bonds, 5's	1,250,000	1,000	94½	95½
New York and East River..				
Bonds 1st 5's	3,500,000	1,000	111	113
" 1st Con. 5's	1,500,000		108	109
Richmond Co., S. I.	348,650	50	70	..
" Bonds	100,000	1,000		
Standard	5,000,000	100	140	142
Preferred	5,000,000	100	156	..
Bonds, 1st Mortgage, 5's	1,500,000	1,000	112	114
Yonkers	299,65	500	130	
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	123	125⅛
" " Bonds (5's)	15 000,000	1,000	115	115½
Bay State	50,000,000	50	4⅛	4¼
" Income Bonds	2,000,000	1,000	..	75
Boston United Gas Co.—				
1s Series S. F. Trust	7,000,000	1,000	..	92
2d " " "	3,000,000	1,000	70	..
Buffalo City Gas Co.	7,000,000	100	2½	2¾
" " Bonds, 5's	7,000,000	1,000	95¼	96
Central, San Francisco	2,000,000	..	105	..
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	104¼
Columbus	1,069,000	.	89	91
1st Mortgage	1,085,000	..	101	103½
Consumers, Jersey City	2,000,000	100	78	85
" Bonds	600,000	1,000	100	103¾
Cincinnati G. & C. Co.	8,500,000	100	202¼	202½
Consumers, Toronto	1,600,000	50	184½	187
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000		..
Consolidated, Baltimore	11,000,000	100	64½	64⅝
Mortgage, 6's	3,600,000	..	107	107½
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	..	..
Consolidated G. & E. Co.'s, Little Falls, N.Y.	90,000	100	..	100
Bonds	75,000	..	..	100
Detroit	4,000,000		57½	60
" Con. Bonds	4,312,000	..	94½	93
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Fort Wayne	2,000,000	..	75	80
" Bonds	2,000,000	..	88	91
Hartford	750,000	25	..	145
Indianapolis	2,000,000	..	115	125
" Bonds, 6's	2 650,000	..	106	107
Jersey City	750,000	20	180	..
Lafayette Gas Co., Ind.	1,000,000	100	78	83
Bonds	1,000,000	1,000	90	91
Louisville	2,570,000	50	..	..
Laclede, St. Louis	7,500,000	100	54	54½
Preferred	2,500,000	100	95	95½
Bonds	9,034,400	1,000	105	105⅜
Montreal, Canada	2,000,000	100	200	..
Newark, N. J., Gas Co.	1,000,000	..	200	220
Bonds, 6's	4,000,000	..	128	130x
New Haven	1,000,000	25	252	..
Nashville Gas Lt. Co.	1,000,000	50	110	..
Oakland, Cal.	2,000,000	..	52	53
" Bonds	750,000	..	..	..
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	99½	99¾
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100.00	1,000	.	108
2d "	2,500,000	1,000	104	105
Peoples, Jersey City	500.000	50	..	175
Rochester Gas & Elec. Co.	2,150.000	50	..	..
Preferred	2,150,000	50	83	..
Consolidated 5's	2,000,000		87½	90
San Francisco, Cal.	10.000,000	100	85⅞	86
St. Paul Gas Light Co.	1,500,000	100	49	51
1st Mortgage 6's	650,000	..	84	87
Extension, 6's	600,000	..	..	..
General Mortgage, 5's	2,400,000	..	88	90
Syracuse, N. Y.	2,500,000	25	17	18
Bonds	1,000 000		94	97
Washington, D. C	2,000,000	20	250	
Western, Milwaukee	4,000,000	100	85½	86
Bonds, 5's	3,556,000	.	101¾	102½
Wilmington, Del.	550,000	50	200	

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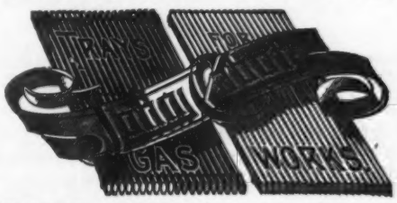

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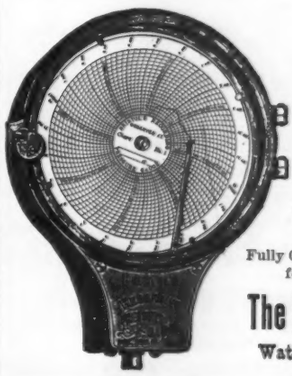

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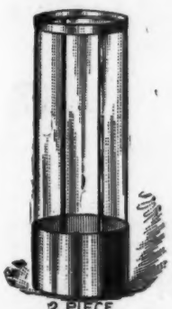

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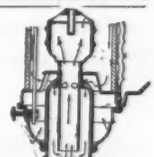

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This system includes: Pantaclinal Mains, which are gas tight when laid and remain gas tight during their life in the ground. Also

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To correct the evils incident to rigidity in lines already laid. To repair breaks in mains so that they will not break again. To permit the use, without future disadvantage from leaks or breaks, of stocks of hub and spigot mains on hand or ordered. To permit the relaying, as Pantaclinal lines, of hub and spigot lines now unduly troublesome and expensive to maintain, owing to heavy leakage and liability to fracture. To flexibly couple wrought iron pipes, and correct the enormous leakage which attends their use in gas distribution when laid with rigid couplings. To correct causes of leakage at service taps.

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And Standard Fire Brick and Gas Retorts.

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A Cement of great value for patching retorts, putting on mouth-pieces, making up all bench-work joints, lining blast furnaces and cupolas. This cement is mixed ready for use. Economic and thorough in its work. Fully warranted to stick.

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In Casks, 400 to 800 pounds, at 5 cents per pound.
In Kegs, 100 to 200 " " 6 " "
In Kegs less than 100 " " 7 " "

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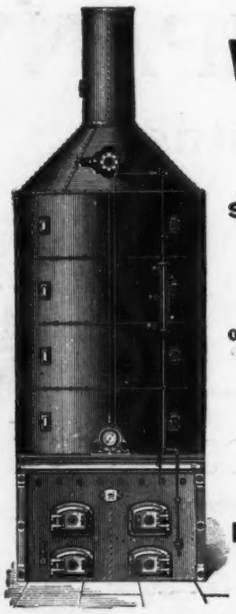

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IRON MASS
For Gas Purification.
Acts immediately, and more efficiently than any other purifying agent now in use.
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Made in all sizes.
Will cut from 2 in. to 24 in.
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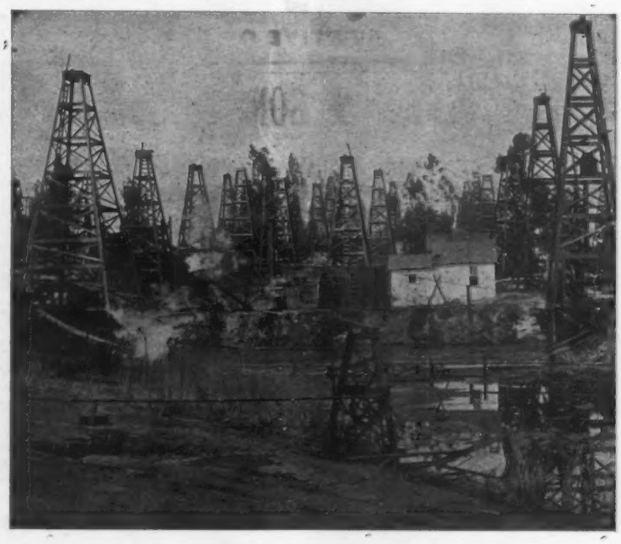

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MORE DIRECT IN ACTION. FEWER PARTS.
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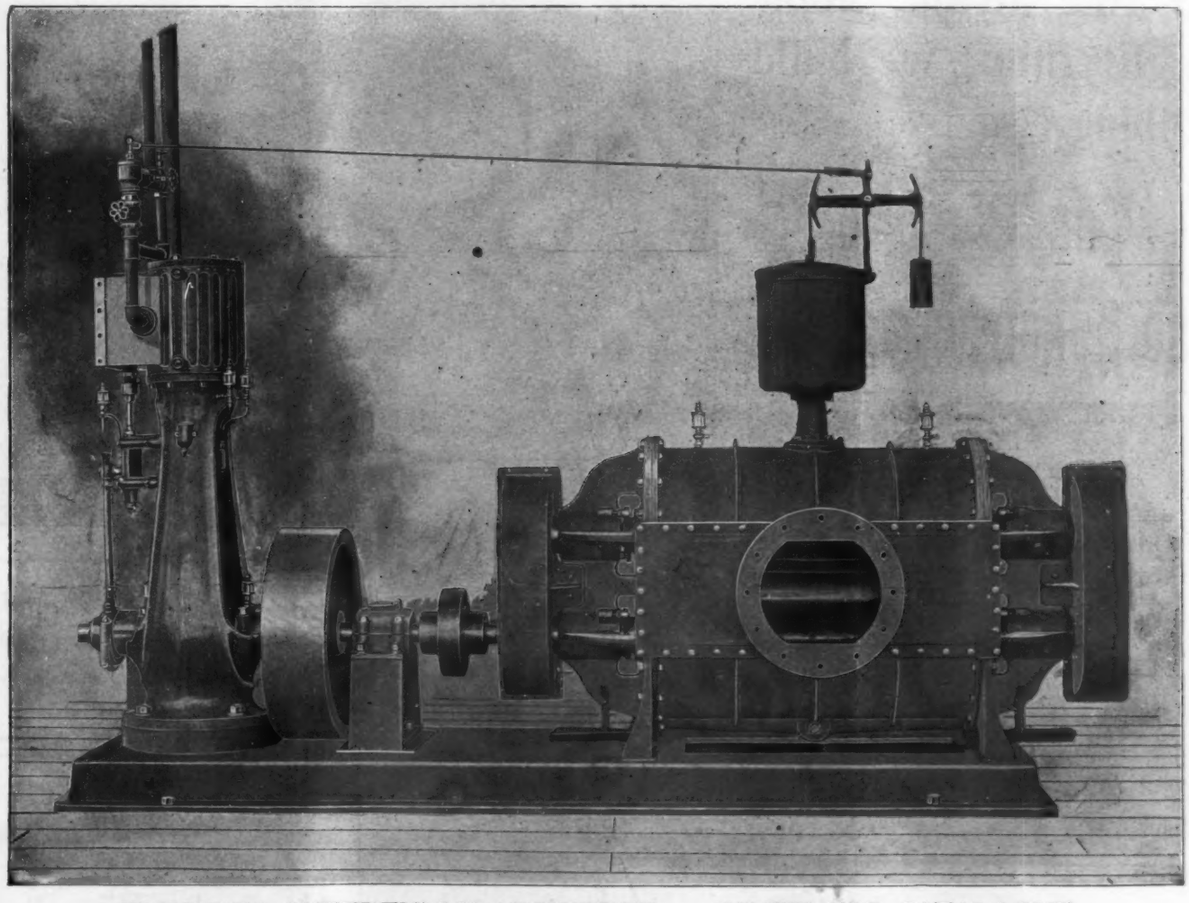

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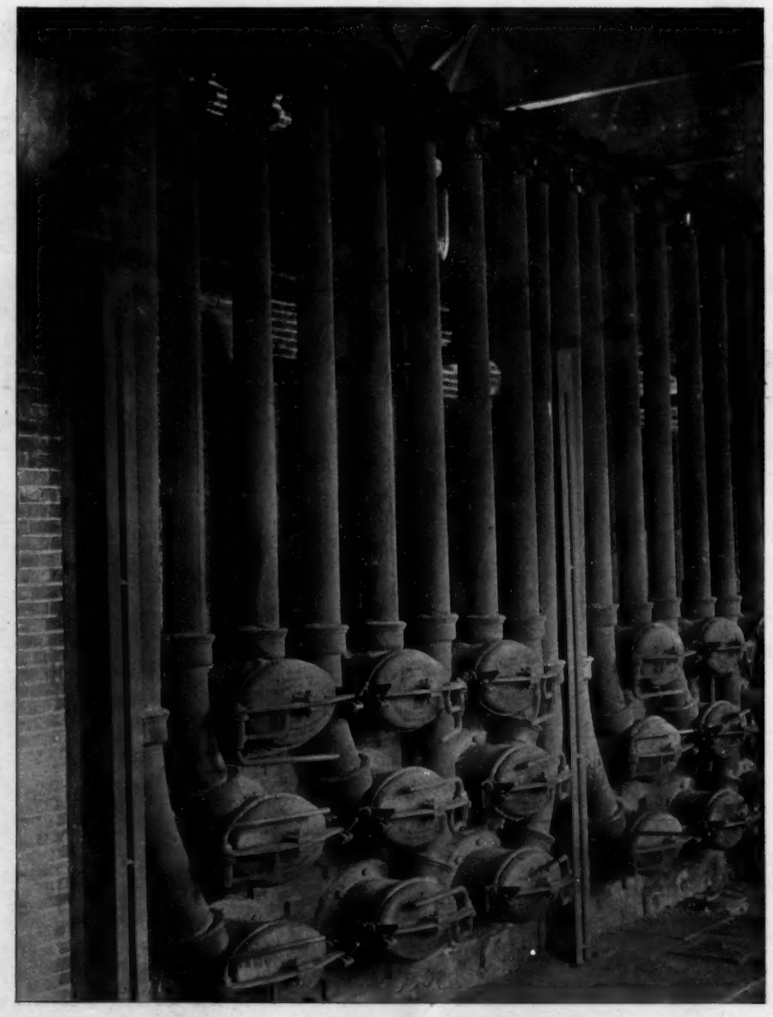

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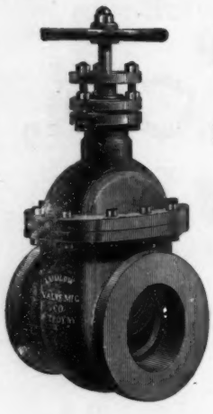

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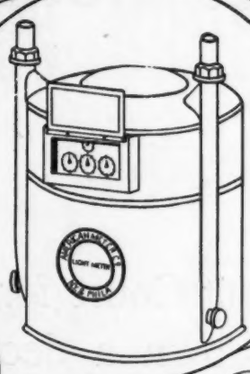
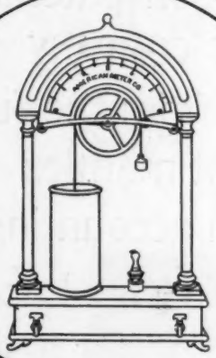
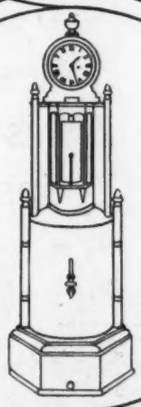
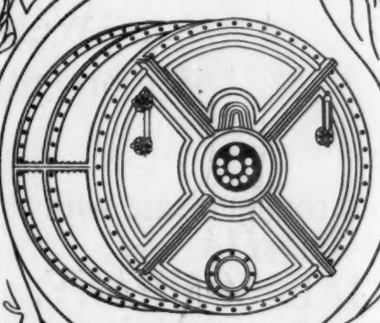
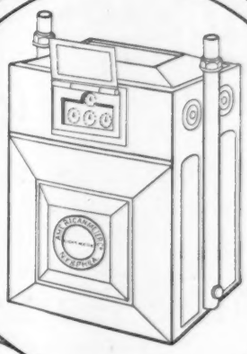
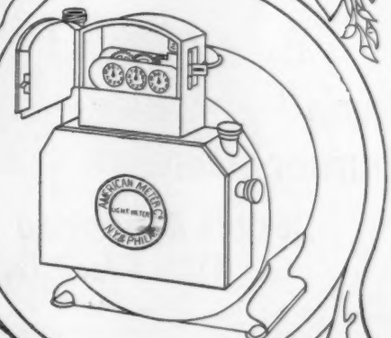












PUBLIC LIGHTING TABLE.

AUGUST, 1898.

Day of Week.	Table No. 1. Following the Moon. Date.	Light.	Extinguish.	Table No. 2. New York City. All Night Lighting. Light.	Extinguish.
				P.M.	A.M.
Mon.	1	No L. FM	No L.	7.10	3.30
Tue.	2	No L.	No L.	7.10	3.30
Wed.	3	7.40 PM	9.00 PM	7.10	3.30
Thu.	4	7.40	9.20	7.10	3.30
Fri.	5	7.40	9.50	7.10	3.30
Sat.	6	7.40	10.20	7.10	3.45
Sun.	7	7.30	10.50	7.10	3.45
Mon.	8	7.30 LQ	11.20	7.10	3.45
Tue.	9	7.30	12.00	7.10	3.45
Wed.	10	7.30	12.40 AM	7.10	3.45
Thu.	11	7.30	1.30	7.10	3.45
Fri.	12	7.30	2.20	7.10	3.45
Sat.	13	7.30	3.20	6.55	4.00
Sun.	14	7.20	4.10	6.55	4.00
Mon.	15	7.20	4.10	6.55	4.00
Tue.	16	7.20	4.10	6.55	4.00
Wed.	17	7.20 NM	4.10	6.55	4.00
Thu.	18	7.20	4.10	6.55	4.00
Fri.	19	7.20	4.10	6.55	4.00
Sat.	20	7.20	4.10	6.45	4.10
Sun.	21	7.20	4.20	6.45	4.10
Mon.	22	8.00	4.20	6.45	4.10
Tue.	23	8.40	4.20	6.45	4.10
Wed.	24	9.30 FQ	4.20	6.45	4.10
Thu.	25	10.20	4.20	6.45	4.10
Fri.	26	11.30	4.20	6.45	4.10
Sat.	27	12.40 AM	4.20	6.30	4.20
Sun.	28	2.00	4.30	6.30	4.20
Mon.	29	3.20	4.30	6.30	4.20
Tue.	30	No L.	No L.	6.30	4.20
Wed.	31	No L FM	No L.	6 30	4.20

TOTAL HOURS LIGHTING DURING 1898.

By Table No. 1.	Hrs. Min.	By Table No. 2.	Hrs. Min.
January	210.40	January	423.20
February	186.40	February	355.25
March	181.20	March	355.35
April	166.10	April	298.50
May	156.40	May	264.50
June	144.30	June	234.25
July	147.30	July	243.45
August	157.10	August	280.25
September	169.50	September	321.15
October	186.00	October	374.30
November	204.30	November	401.40
December	218.30	December	433.45
Total, yr.	2129.30	Total, yr.	3987.45

Welsbach Patent Sustained.

INJUNCTION GRANTED.

Judge Townsend, in the United States Circuit Court for the Southern District of New York, has handed down a decision sustaining the Welsbach Light Company's Rawson patent, and adjudged **THE SUNLIGHT INCANDESCENT GAS LIGHT COMPANY** to be an infringer. This Company has been enjoined from the further use of its method of manufacture of incandescent mantles or the sale or use of the same, and ordered to render an accounting.

A further decision has been handed down by Judge Lacombe in the United States Circuit Court, granting a motion for a similar injunction against **THE REX INCANDESCENT LIGHT COMPANY.**

Every other manufacturer of incandescent mantles in the United States is under these decisions an infringer of this patent, and the Welsbach Light Company will proceed against them at once.

We again caution gas companies and the public generally against the purchase of any incandescent mantle other than that made and sold by the Welsbach Light Company or its agents.

Every genuine Welsbach lamp has the trade mark "Welsbach" conspicuously printed upon the package and upon the burner itself.

Dealers desiring to handle the genuine article should communicate with the

WELSBACH COMMERCIAL COMPANY,

Drexel Building, Philadelphia.

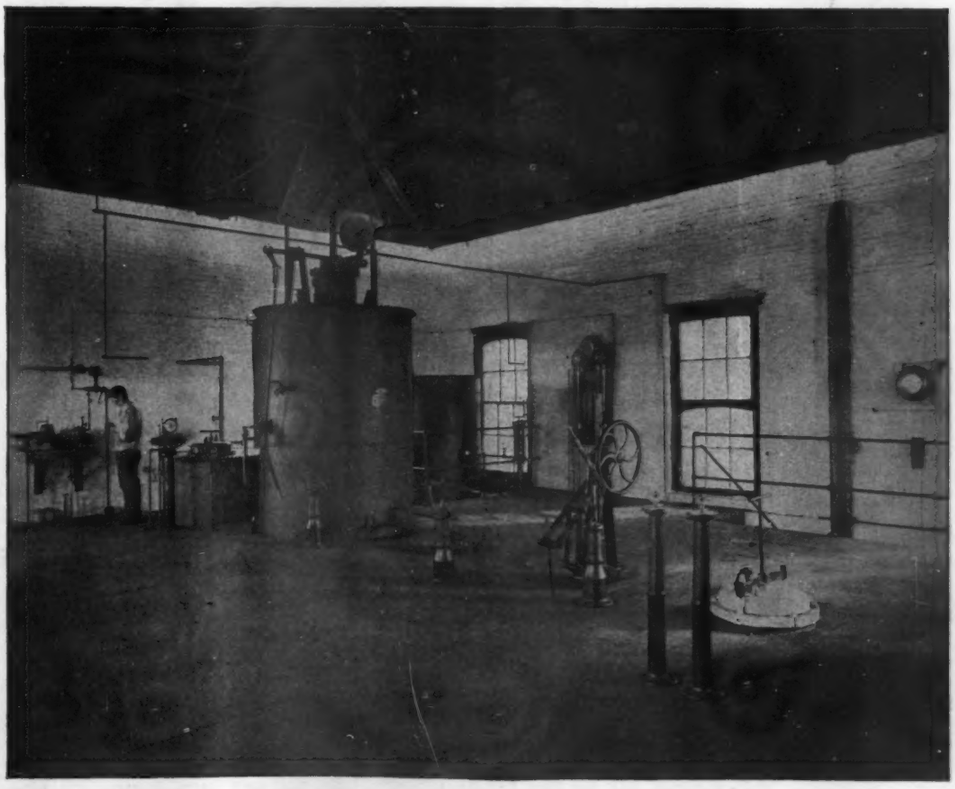
The United Gas Improvement Company,

DREXEL BUILDING, PHILA., PA.

The Standard Junior,

The Standard Double Superheater,

LOWE WATER GAS APPARATUS.



Total Built and under Construction,

288 Sets—Daily Capacity, 185,425,000 Cu. Ft.

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GASHOLDERS, with or without Steel Tanks.

Purifiers, Condensers, Scrubbers, Oil Tanks, Smoke Stacks.

STEEL ROOFS and BUILDINGS.

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——OWNS, CONTROLS AND OPERATES——
EXCLUSIVELY

THE NEW IMPROVED AND PATENTED STREET LIGHT BURNER.

STYLE No. 81.

Our PATENTED "STREET LIGHT APPLIANCES" have made WELSBACH STREET LIGHTING a complete success.

By the UNIFORM DISTRIBUTION of light on scientific principles a greater area can be lighted by our system and more economically than in any other way.

Where there are no gas mains already laid, we can furnish an equally good light by our **SELF-GENERATING NAPHTHA WELSBACH BURNER,** enabling Gas Companies to furnish a uniform light in all localities.

Lists of Cities and Towns in which we are now lighting under contract will be furnished upon application.

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CORRESPONDENCE SOLICITED FROM GAS COMPANIES AND OTHERS INTERESTED IN MUNICIPAL LIGHTING.

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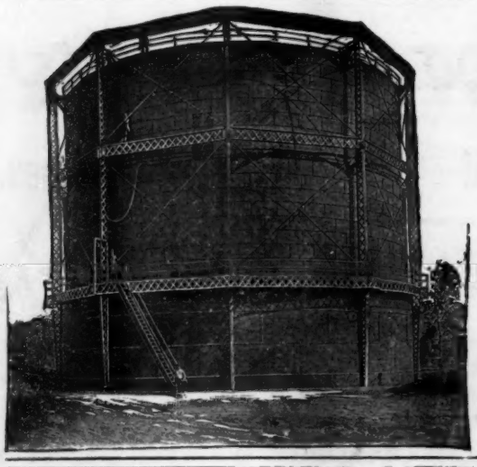

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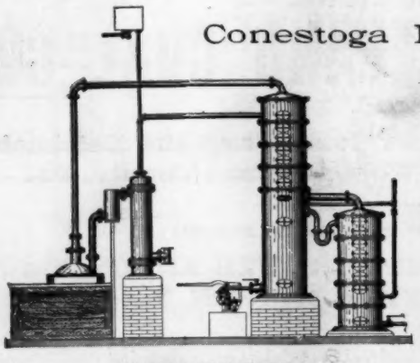

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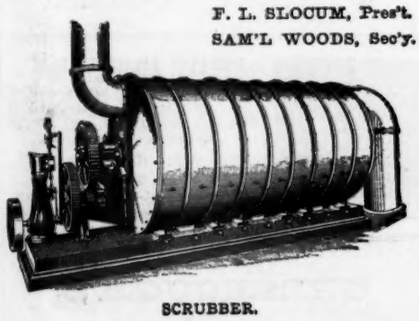

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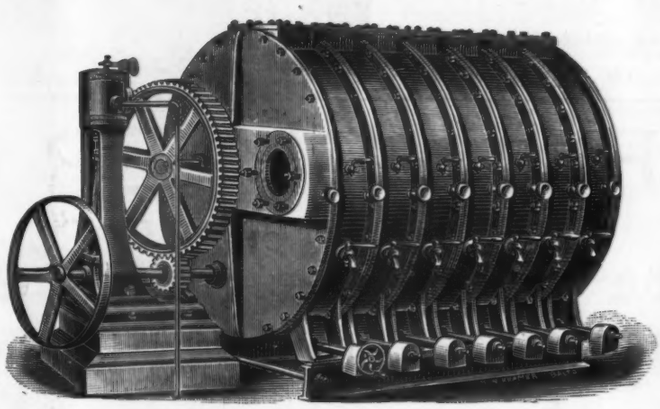

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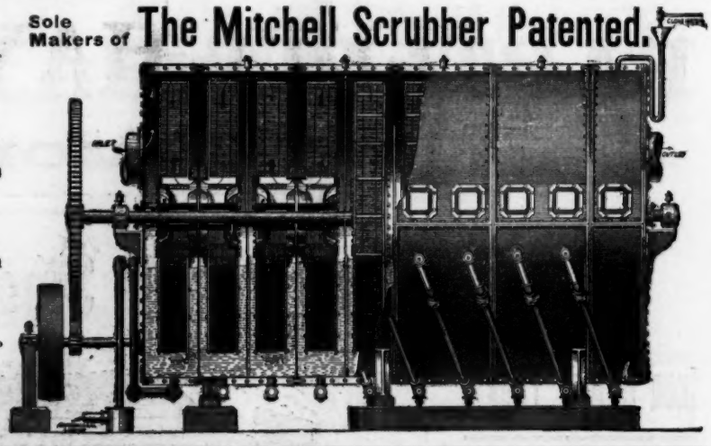

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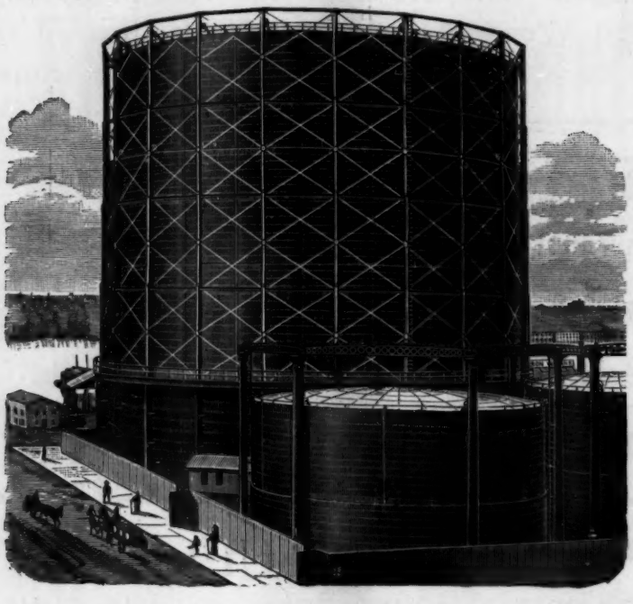

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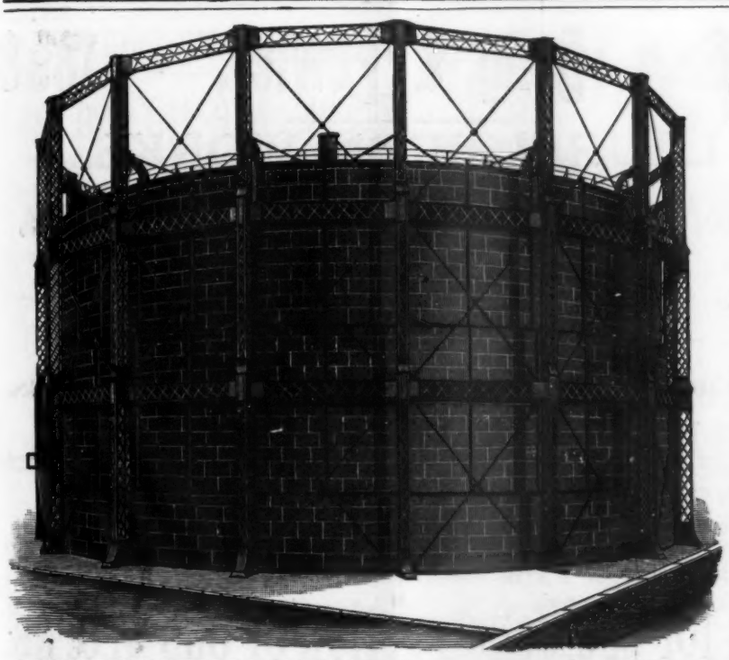

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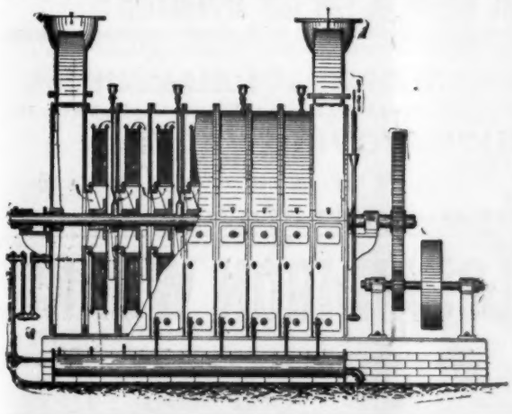

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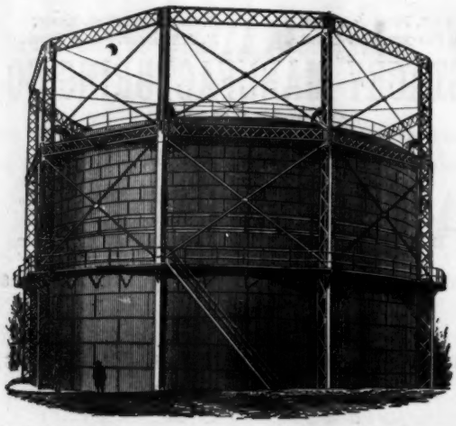

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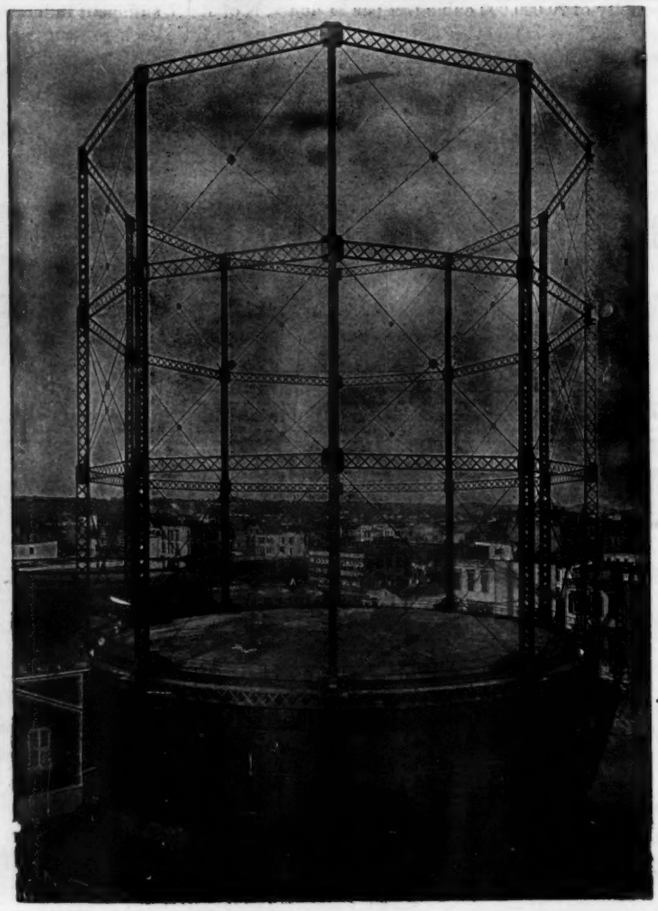

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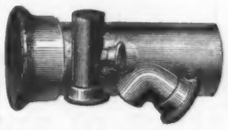

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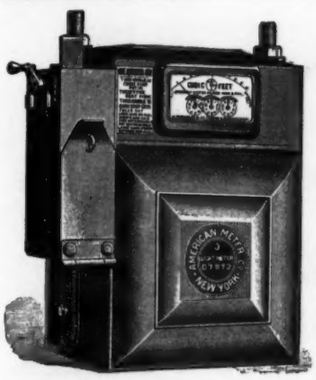

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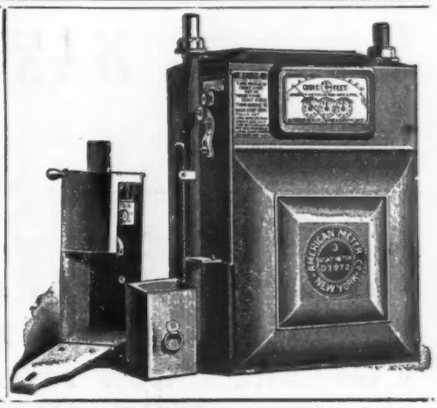

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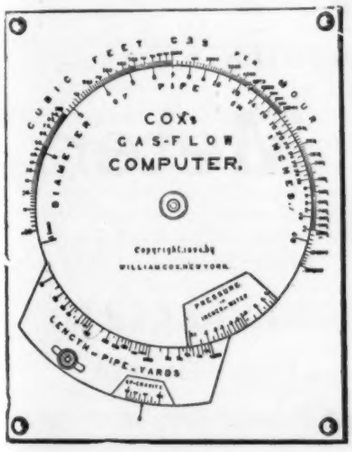

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